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Heat-Treating Brass Parts in Process

By Kenneth C. Monroe
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THE importance of proper heat-treatment on the working and finishing qualities of brass employed for drawing and stamping purposes has been demonstrated in experiments made by the Bridgeport Brass Co. These experiments were made on the regular process work over a long period of time, and showed conclusively that the annealing of brass between drawing operations must be considered as a major operation requiring close attention, and that a final product of accuracy and high-grade finish cannot be obtained without proper control of this detail. In many shops where the press working of brass is done, annealing is often considered merely as a secondary operation to facilitate the drawing of the metal, and poor results in the finished product are likely to be attributed to the dies or to the original composition of the metal, when they are in reality due to faulty annealing between operations.

The old method of annealing brass shells in preparation for further drawing was to keep them in the furnace for a period of 30 minutes or so, and then allow them to

Fig. 1—Loading the heat-treating baskets

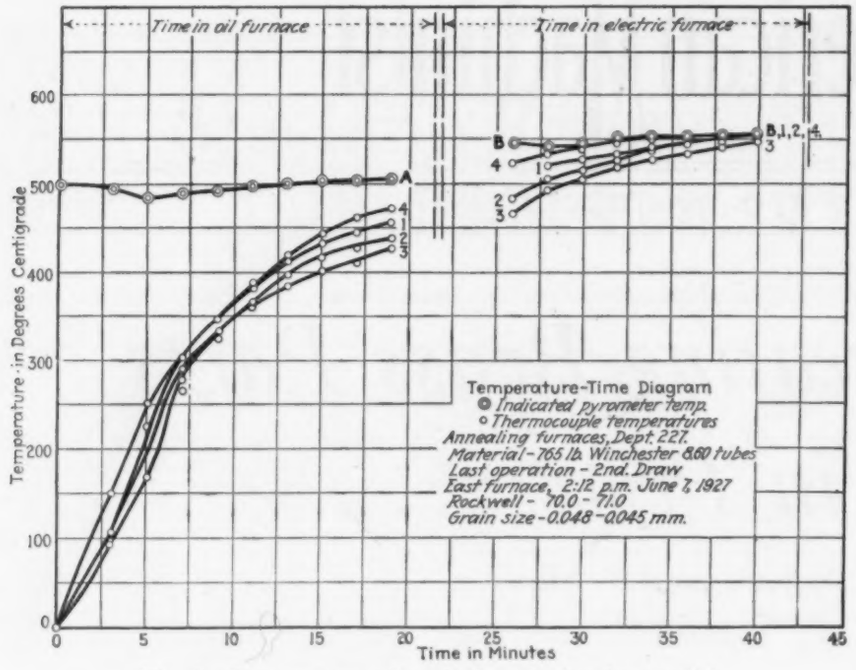
Time in oil furnace
Time in electric furnace
Temperature in Degrees Centigrade
Time in Minutes
Temperature-Time Diagram
Indicated pyrometer temp.
Thermocouple temperatures
Annealing furnaces, Dept. 227.
Material - 765 lb. Winchester 860 tubes
Last operation - 2nd. Draw
East furnace, 2:12 p.m. June 7, 1927
Rockwell - 70.0 - 71.0
Grain size - 0.048 - 0.045 mm.

Fig. 2—Temperature rises during the heating period

cool. An oil-fired furnace was employed, the temperature of which was kept at a low red heat. The insertion of the cold shells, however, caused a large drop in the temperature of the furnace, and the temperature of the shells rose only slowly to near the desired point. Moreover, while the temperature in the arch of the furnace was kept at 550 deg. C., the temperature at other points varied widely, and at the end of the heating period there was found to be a large variation in the final temperatures of shells in different parts of the heating baskets or pans. Any increase in the furnace temperature to bring the more distant shells up to the proper annealing range would naturally cause over-annealing of some of the shells. Over-annealing, caused by the desire to eliminate hard spots in the brass from too low a temperature, is a common fault in brass working, and is the cause of many costly rejections in the plating and polishing departments. Over-annealing causes excessive grain growth, with the result that it is difficult to buff or polish the article to the required finish. In bad cases of over-annealing the surface of the brass sometimes takes on a rough surface resembling somewhat the outside of an orange. On the other hand, hard spots resulting from an uneven heating will cause unequal drawing of the metal in the dies, resulting in improper forming and inaccurate work, as well as shorter tool life. It is estimated that the reduction in scrap work alone by the better control of annealing temperatures more than paid for the extra investment required, besides the actual savings in increased production and reduced labor in the heat-treating department. This was largely accomplished by a combination of oil-fired and electric muffle furnaces.

The proper relation of temperature in the oil-fired furnace and electric muffle was found only after a great amount of experimental work. Efforts to run the oil-

Fig. 3—Quenching the brass shells after heat-treating

fire temperature nearer to that of the electric muffle resulted in work being unevenly annealed in the oil fire with not enough work left to be done in the electric muffle. Under such conditions the thermostatic control in the electric muffle would open the circuit on the heating element with the pan loads unevenly heated. By running the oil fire 50 deg. C. below the temperature of the electric furnace, it was found that all parts of the pan loads would come up quickly to the proper temperature. The conclusion, therefore, was that this combination of equipment will anneal pre-heated work very effectively, but should not be used with the idea of "soaking" work already sufficiently annealed.

Fig. 4—Dumping the shells into tumbling barrels

The annealing equipment consists of an oil-fired furnace and an electric furnace in series. A front view of the oil furnace is shown in Fig. 1. The brass shells or other parts are delivered to the department on a "Dept. to Dept. Transfer Slip." The barrels of shells are lifted by a hand-operated electric crane and dumped onto the two heavy steel wire baskets on the runway. Each basket holds 3½ barrels of shells. The baskets are then hooked to the ones already in the oil furnace through a slit in the furnace door. When the baskets in the electric furnace are drawn out, they in turn drag the baskets from the oil furnace to the electric furnace, and the new baskets from the runway to the oil furnace. All four doors are lifted simultaneously by a pneumatic lifter to avoid cooling the furnace by slow opening and closing. The time of heat for the charge in each furnace is 20 min., making 40 min. total time as compared with a previous time of 30 min. in the one furnace formerly used. Two baskets of work are delivered, however, every 20 min. by the series heating method, and an increased production of 50 per cent is thus obtained.

In Fig. 2 is shown the working temperature conditions in the two furnaces. When the brass parts are placed in the oil furnace the temperature at various points

Fig. 5—Pickling the shells while in the barrels. Fig. 6—Final tumbling and cleansing of the shells

of the basket rises gradually as indicated by the curves 1, 2, 3 and 4. The temperature in the arch is shown by the curve *A*, and is kept at 500 deg. C. The temperature of the corresponding location in the electric furnace is maintained at 550 deg. C., as shown at *B*, there being only a slight drop after the parts are drawn in. When the brass shells have been in the electric furnace 15 minutes the furnace temperature is fully back to normal, and at the end of the 20-min. period all parts of the basket have reached the correct furnace temperature, and the work is ready for quenching.

The quenching of the shells is done on the table shown in Fig. 3, where the baskets remain when withdrawn from the second furnace. The cooling water is circulated in a pipe which runs around the table, and is pierced by a row of small holes. The spray from the holes covers the work effectively. When the parts are cooled the baskets are dumped, Fig. 4, and the shells raked through four holes in the table into four hexagonal tumbling barrels. These barrels are set on low trucks which are rolled out from underneath the table, and the barrels carried by crane to the dipping tanks.

The tumbling barrels, which are perforated to permit free access of the cleaning solutions, are dipped by crane, Fig. 5, into the pickling tank containing a solution of sulphuric acid. The time in the tank is from 3 to 4 minutes. From the acid tank the barrels are again lifted by crane and set in the tumbling machine, Fig. 6. The tumbling is done with a hot soap solution followed by clear water, which is run through the end of the barrel. The operations of pickling, tumbling and rinsing are done between the time of quenching and withdrawal of another heat, so that the entire annealing cycle is 20 min., or the time of heating in one furnace.

An important advantage of the series arrangement of the annealing furnaces is that the cycle of operations may be definitely maintained regardless of the weight of the loads annealed. In the case of annealing with oil fire alone, the work to be heated is exposed to a temperature much higher than the proper annealing temperature, and the time in the furnace is greater for heavier loads than for lighter loads. To try to maintain a uniform cycle with a variety of work using oil fires only was found to result in over-annealing of light parts and under-annealing of heavy parts. The thermostatic control in the electric muffle eliminates this trouble, and makes the operation of the annealing department much simpler from the labor standpoint.

The location of the annealing furnaces in relation to the machining operations is also an important factor in cost reduction. Because of the greatly increased cost of brass over steel, the amount of work in process must be correspondingly reduced if excessive inventory costs are to be kept down. This is accomplished by having the annealing furnaces as near as possible to the lines of normal progress of the work in process. For the plant handling large quantities of various parts in simultaneous process, such as the conditions existing at the Bridgeport Brass Co., it has been found better to decentralize the heat-treating, and install units of equipment at strategic points in the plant. The extra cost of equipment is more than offset by the savings in reduced work in process, handling charges, and easier control.

Provide appropriate means for ejecting work from jigs and fixtures when the component closely fits a plug or locating plate. Suitable ejectors will save time.

Seen and Heard

By John R. Godfrey

Indifferent selling—Limited markets

By John R. Godfrey

BUYING machinery seems to be about as hard as selling in some cases. It's a good deal like going into a store and waiting for an indifferent clerk to get through telling her chum about a "marvelous" date with her boy friend. For there are too many machine salesmen who don't even follow up a live inquiry, let alone chasing up a new prospect.

One of my friends wanted a new lathe some weeks ago, and wanted it quick. So he called up two of the largest dealers in town and told them what he wanted, and when. Instead of hopping on to the job the salesman who answered the 'phone said he'd look up a few circulars and put them in the mail. And this in spite of the fact that the customer distinctly stated that the order would be placed within the next two or three days.

Finally he got hold of a young salesman from a smaller concern and got just what he wanted—and quick. The next month a man from one of the big concerns called to see why they hadn't received any orders recently. He found out, with more emphasis than elegance. Of course he couldn't understand it—must have been some mistake in the office. But it's these mistakes that prevent sales and lose customers to other dealers. And then they complaint because business isn't brisk!

* * * *

It's funny how often we feel sure we can solve the other fellows' problems—and how seldom we even know what they are. One case that comes to mind is where two old shop mates got together after long years of separation. One had blossomed into an automobile manufacturer of large repute and even larger output. The other had stuck to machine tools—and he made good ones, too. Naturally they compared businesses in a general way.

"The trouble with you machine tool builders is that you do business on too small a scale. That's why the tools cost you so much to make and us so much to buy. Now if you'd only build those little millers of yours in lots of five or ten thousand, you'd get the price down and make more money." 'Twas the automobile maker speaking, of course.

This is perfectly logical reasoning from the automobile standpoint. But he quite overlooked the fact that ten thousand of these machines could not be sold in the whole United States.

Makers of products that sell by thousands cannot understand the problems of the maker whose sales are necessarily very limited. And limited sales are just as much of a problem as limited production.

An idea of the increased work being undertaken by technical societies may be had from a recent report of the A.S.M.E. There are now 250 technical committees, an increase of 74 during the past year.

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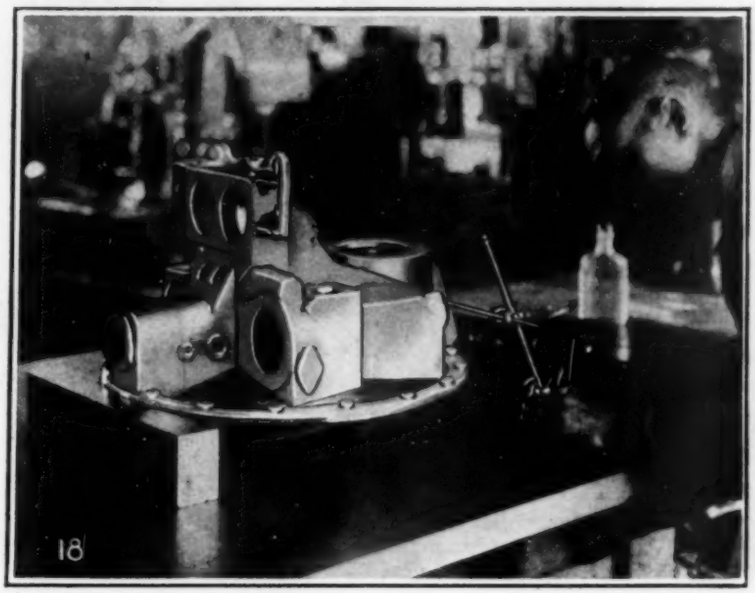

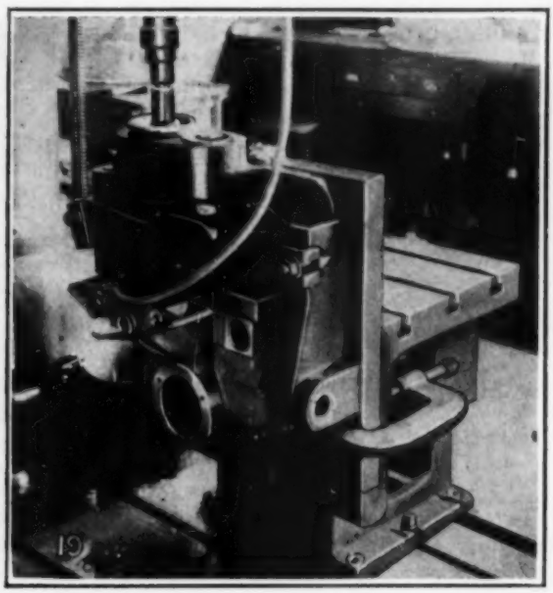

Fig. 18—The rear-end section is leveled upon a surface plate and all surfaces to be machined are checked over with a surface gage before any work is done upon the casting. A line circumscribed on the periphery of the flange becomes the point of departure from which machining operations are measured. Fig. 19—Fixtures in which boring bars, piloted reamers and core-drills are supported by permanent bushings above and below the work-piece, locate the bearing surfaces in line with each other

The Air-Cooled Radial "Wasp"

The rear-end section carries the magnetos and the carburetors

By Ellsworth Sheldon
New England Editor, American Machinist

DUAL ignition, the principle of which is employed to some extent even in connection with engines for automobiles, is of vital importance to the aviator, the stoppage of whose engine in mid-air is fraught with dire possibilities of which the mere ground driver is blissfully ignorant. Hence Wasp engines are equipped with two complete and entirely independent means of firing the charges in its cylinders. It is the purpose of the rear-end section to carry not only the two magnetos for this duty, but the carburetors, pumps and other auxiliary apparatus necessary to the functioning of the engine.

The aluminum casting from which the rear-end section is made is a very awkward piece to handle, especially at the start, as may be seen by a casual inspection of its shape as shown in Fig. 18, which shows it at this stage.

The fourth article. The fifth will appear in an early issue.

Except for facing the rabbeted flange and the projecting shoulder, and facing at an angle the edges of the fixed vanes, as may be seen in Fig. 14 of the preceding article, there is no lathe work upon it.

There are, however, several milling operations to face the bosses and bearing spots to which to attach the auxiliary machinery, drilling and tapping operations for the bolts and screws with which they are to be attached, and boring, counterboring and facing operations for the shafts and ball bearings of the shafts that are to drive them. All of the milled surfaces and the center lines of the bored holes must bear an accurate and unvarying relation, not only to all others in the same section, but to parts upon the section to which it is to be secured in the assembly.

The first machining operation is, therefore, to face the flange, since this surface, once established, becomes

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a point of departure—as well as a means of holding the casting—for subsequent operations. Before going to the lathe, however, the casting is set up as shown in Fig. 18 and all surfaces to be machined in any way are carefully checked over to make sure that the casting will clean up at all necessary places.

Having so adjusted it as to bring all important points into correct relation, the operator scribes a line around the periphery of the flange, and when the casting is set into the lathe fixture for the facing operation the various holding bolts and clamps of the fixture must be so adjusted as to make this line run in a true plane.

Shafts for Driving Auxiliary Equipment

Shafts pass through the wall of this section from the blower section to drive the magnetos. Other shafts at right angles to these and wholly within the rear section, derive their movement through miter gears from the first ones to run the fuel and oil pumps. It is to seat the bearings for the vertical shafts that the fixture shown in Fig. 19 is principally employed.

The base of the fixture is a cast-iron plate, rectangular in section, having a circular opening to fit the rabbeted flange of the section. One side of the plate is machined flat and has a transverse rib to support its weight upon the table of a radial drilling machine, to the apron of which the fixture is secured in a vertical position by C-clamps. Ears, or bosses, on the opposite side are bored and bushed to carry boring bars in proper relation to each other and to the work. A narrow leaf, pivoted at one end, swings into place behind the work-piece and is secured by a hinged bolt at the opposite end.

Whenever it can be done, the core-drills, reamers, etc., used on this part are piloted and are aligned by permanent bushings in the fixture, both above and below or on both sides of the work. Seats for the bearings of the principal shafts are machined with multiple-tool boring heads carried on bars that are aligned wholly by the fixture and are driven by a floating connection to the spindle of the machine.

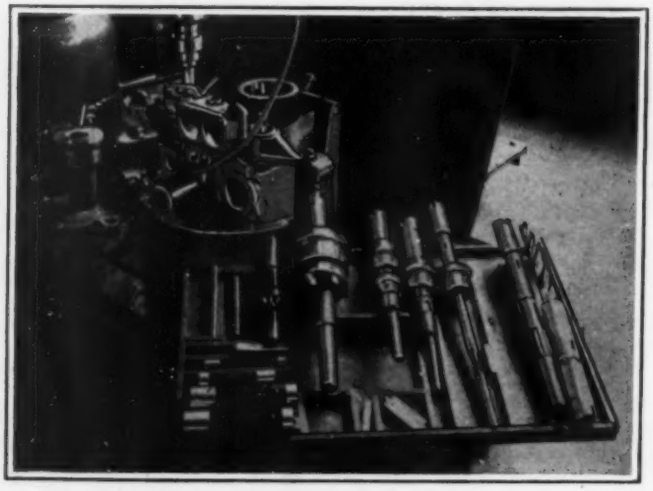

Fig. 20—The boring fixtures are of different types, some of them being used in a vertical position while others are used horizontally. They are used on radial drilling machines, by which the tools are driven through floating holders

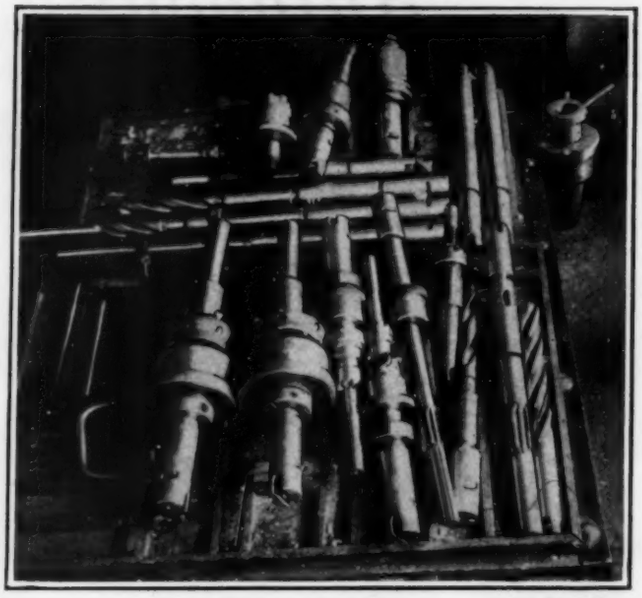

Fig. 21—Core-drills, piloted reamers, counterbores, facing tools, boring bars with multiple tools and single end cutters, and many other tools are used with these fixtures

A fixture similar in principle but differing considerably in the manner of using it, is employed to machine the seats for the bearings that carry the magneto shafts. This fixture, shown in Fig. 20, is used in a horizontal position on the floor plate of the same radial drilling machine, from which it is blocked up to a height that will enable the operator to do the work with the least effort.

An idea of the multiplicity of operations that are performed upon the work-piece may be gained from an observation of the trays of tools that are shown in Fig. 20 with the fixture, and in Fig. 21 separately. The tools of the latter set belong with the first fixture.

There are many minor operations of drilling to be performed for which simple, plate jigs, attached to and located by already machined surfaces of the work-piece, are provided for use upon single-spindle, sensitive drilling machines. To drill holes at awkward angles there are supporting jigs to locate and hold the work-piece from the large flange. Several of these jigs are also used in sensitive drilling machines, presenting the work at the proper angle to the drill.

Some of the bosses to which auxiliary mechanisms are attached cannot easily be reached by any kind of counterboring or facing tool guided by a bar, and they are swept off by milling cutters with the part held in fixtures, the sole office of which is to present the work to the cutter at the proper angle.

Other holes require no jigs or fixtures. Within the casting is a large, cored reservoir to contain the lubricating oil that is pumped to the bearings of the engine. It is a matter of great importance that the oil be kept perfectly free from particles of grit, and to assure absolute cleanliness in this respect, the casting is made with several openings entering the cored space at different angles. These openings are core-drilled and tapped for screwed plugs, after which the interior surface of the reservoir is thoroughly cleaned and enameled.

Machining and Measuring Gear Teeth

By Earle Buckingham
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Massachusetts Institute of Technology

Relieving pinion-shaped cutters—Modification of pitch by change in the cone angle of the cutter—Nature of a shaped tooth surface and the limitation of this method

SIDES of the teeth of pinion-shaped gear cutters must be relieved to give a proper cutting edge, but must retain the correct form at the proper diameter. This is accomplished by making these relieved surfaces involute helicoids; the relief on one side of the tooth being right hand, while the relief on the other side is left hand. In other words, one side of the relieved tooth is a right hand helical gear while the other side is a left hand helical gear. Mathematically, these cutters are nothing more than multiple-threaded hobs with an infinite lead, the cutting action being obtained by reciprocating the cutter instead of revolving it. The tops of the teeth are also relieved in such a way that the width at the top of the cutter tooth remains approximately the same. As the face of the cutter is ground back when it is re-sharpened, a different portion of the involute profile of the cutter comes into action. This, however, as we have seen before when considering the action of one involute with another, does not change the form of the gear produced.

The intersection of the side-relieved surfaces of the cutter with a plane perpendicular to its axis is an involute curve. The front face of these pinion-shaped cutters is not a plane, however, but is a conical surface. Fig. 63 shows a cutter in front elevation and axial section respectively. Line *AB* is the intersection line of the conical front surface with the drawing plane. The cross-section resembles a lathe or planer tool.

Involute intersection curves are obtained by intersecting the relieved side surfaces of the cutter with planes that are perpendicular to the axis of the cutter. If these planes are equally spaced, the involute intersection curves will be twisted uniformly from some common centerline, the amount of this twisting depending upon the lead of the involute-helicoidal relieved surfaces. The twisting or turning angle Δ' in Fig. 63 is dependent upon the axial distance of the intersecting plane from the apex *A*. Thus, when this distance is equal to the lead of the involute-helicoidal surfaces, the turning angle is equal to 2π radians.

The profile of the cutting edge of a pinion-shaped cutter with a conical face is not a true involute curve. For example, with a 4-D.P., 20-deg. stub tooth cutter of 3 in. pitch diameter, the deviation of the profile from the true involute is —0.00032 in. at the outside diameter, zero at the pitch diameter, and —0.00021 in. at the base circle.

The actual cutting profile is plotted against a true involute profile in Fig. 64. The error is small, and is less than the other probable errors which develop in the mechanical processes of making and using these cutters. The actual profile is less curved than the theoretically correct one. The cutter therefore removes somewhat more material at the tip and root of the generated gear than it ought to do. An error in this direction is preferable to one in the opposite direction which would leave too much metal on the gear teeth at these points and tend to develop interference.

Great care should be exercised when re-sharpening these cutters. A change in the angle of the conical front face alters the profile of the cutting edge so that it would generate gears of a slightly different normal pitch, or pressure angle at a fixed center distance, than it would when this angle is correct. This conical grinding must be concentric with the cutting edges, else these cutting edges will become eccentric. Due to the relieved surfaces of the cutter, carelessness in re-sharpening will impair the accuracy of the cutting edges.

It is of interest to determine the effect of grinding these cutters to a different cone angle at the front face. The calculation is involved, but the results will be given:

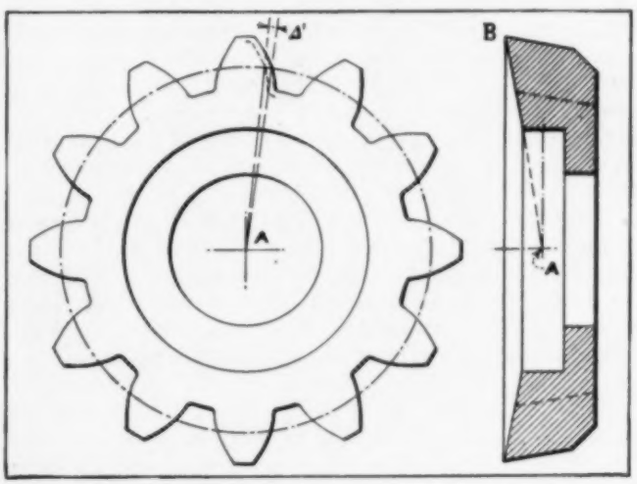


Fig. 63—Typical pinion-shaped gear cutter

The tenth article. The eleventh will appear in an early issue.

Thus for a 3-in. pitch diameter cutter with a nominal pressure angle of 20 deg., we get the following values for the angle of the tangent to the profile of the cutting edge at the pitch line, or pressure angle: This tabulation also includes the normal pitch for 1 D.P.

Front Cone Angle	Pressure Angle	Normal Pitch, 1 D.P. Inches
0° 0′	20° 11′ 51″	2.94842
0° 30′	20° 10′ 40″	2.94878
1° 0′	20° 9′ 30″	2.94915
1° 30′	20° 8′ 19″	2.94952
2° 0′	20° 7′ 8″	2.94989
2° 30′	20° 5′ 57″	2.95027
3° 0′	20° 4′ 46″	2.95064
3° 30′	20° 3′ 34″	2.95101
4° 0′	20° 2′ 22″	2.95138
4° 30′	20° 1′ 11″	2.95175
5° 0′	20° 0′ 0″	2.95212
5° 30′	19° 58′ 49″	2.95249
6° 0′	19° 57′ 38″	2.95286
6° 30′	19° 56′ 26″	2.95323
7° 0′	19° 55′ 13″	2.95361
7° 30′	19° 54′ 1″	2.95399
8° 0′	19° 52′ 48″	2.95437
8° 30′	19° 51′ 35″	2.95475
9° 0′	19° 50′ 22″	2.95513
9° 30′	19° 49′ 9″	2.95551
10° 0′	19° 47′ 56″	2.95589

It will be seen from the foregoing tabulation that a change of 1 deg. from the normal front cone angle of 5 deg. will change the normal pitch of a 1-D.P. cutter, 0.000074 in. For a 6-D.P. cutter, the change would be one-sixth of this amount or 0.000012 in. The normal pitch increases with an increase in this cone angle and decreases with a decrease of the cone angle. Advantage of this characteristic of pinion-shaped cutters can sometimes be taken, either to correct for small errors in the cutters or to maintain a definite normal pitch relationship between mating gears.

The cutting action of a pinion-shaped cutter is very similar to that of an ordinary shaping or planing tool except that the size of the chip removed is not constant at every stroke. As with hobbing, when the first roughing cut is made, most of the cutting takes place on the entering side of the gear blank. By the time that a tooth space of the gear has reached the common centerline of gear blank and cutter, most of the metal has been removed.

Again, as with hobbing, the cutting edge at the outside diameter of the cutter is not only relatively short, but on roughing cuts it also removes about one-half of the metal.

Effect of Irregular Loads

The cutting edges at the sides of the cutter do not cut continuously. First one side will be cutting, then both sides together, then the opposite side only, etc. With this process, as with hobbing, the tendency of these side cutting edges of the cutter is to drive the gear blank ahead at one instant and to hold it back at another instant. This combination of irregular loads, both in amount and direction, makes it necessary to take individual finishing cuts on the two sides of the gear teeth in order to reproduce the maximum of the accuracy of the gear shaping machine and cutter.

The tooth profile surfaces of gears shaped with pinion-shaped cutters is composed of a series of hollows and ridges extending across the face of the gear. The feed on finish cuts must be fine enough so that these ridges will be readily crushed down when operated under load. These continuous ridges resist this crushing more than the isolated peaks left by hobbing do.

These ridges are not evenly spaced along the tooth profile but are very much closer together below the pitch line than they are above it. The feed should therefore be selected to give a sufficiently fine feed on the outer part of the tooth profile.

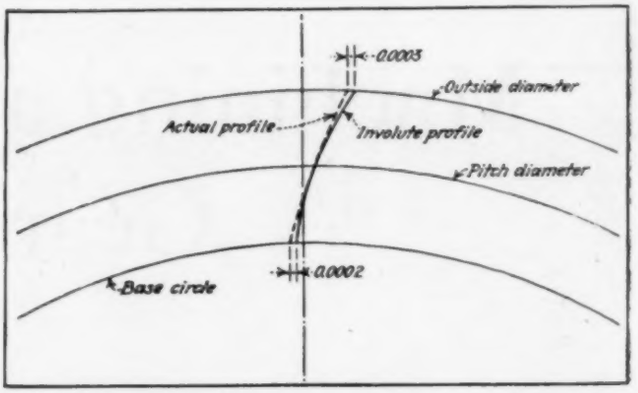


Fig. 64—Error on cutting edge of a pinion-shaped cutter

The most effective use of this process of shaping gear teeth with pinion-shaped cutters is on gears of relatively small diameters and fine pitches. This process is extensively used in the production of gears for the automotive industry where the sizes are relatively small and the pitches are relatively fine. The limitations of the cutter, as pointed out before, preclude its use on large gears of coarse pitch.

This process has the advantage of being able to cut gear teeth that are close to a shoulder. Thus when space and weight are limited, several gears of different diameters can be made integral with a narrow recess between them and the teeth can be generated by this method.

This process can also be used in the production of sprockets for chain drives, small cams, ratchets, etc., by providing a suitable cutter which is conjugate to the form to be produced.

Is the Sherman Law Obsolete?
Discussion

By J. F. Lincoln
Vice-President, Lincoln Electric Co.

IN THE issue of July 28, the first editorial is on the subject "Is the Sherman Law Obsolete?"

It seems to me this is a particularly apt question at this time. We have obsoleted practically all law which so far has been given to us, starting with the Ten Commandments. There are very few people at the present time who do not feel that a host of new laws should be passed and most of the old ones eliminated.

The Sherman Anti-Trust Law was passed because of the fact that human selfishness in the shape of big business throttled all competition. If it had resulted in anything else than higher cost for the masses and enormous unearned rewards for the few, it could have been easily justified. However, it was found that the average trust had one idea in mind only and that was to give as little as possible and grab as much as could be gotten away with. The Sherman Anti-Trust Law stopped this, at least to some extent.

If human nature has changed in the last forty years it may be that we can successfully eliminate this law. I, myself, however, am skeptical as to a complete change in human nature in forty years when there was no very great evidence of a change during the previous two thousand. The Sherman Anti-Trust Law or some hard-boiled traffic cop is just as necessary now as forty years ago.

Portable Toolroom Machinery

Photographs by courtesy of the National Cash Register Co., Dayton, Ohio.

Fig. 1—Stoning machine for punch work. The machine is mounted on a cast-iron frame and is equipped with a seat for the operator

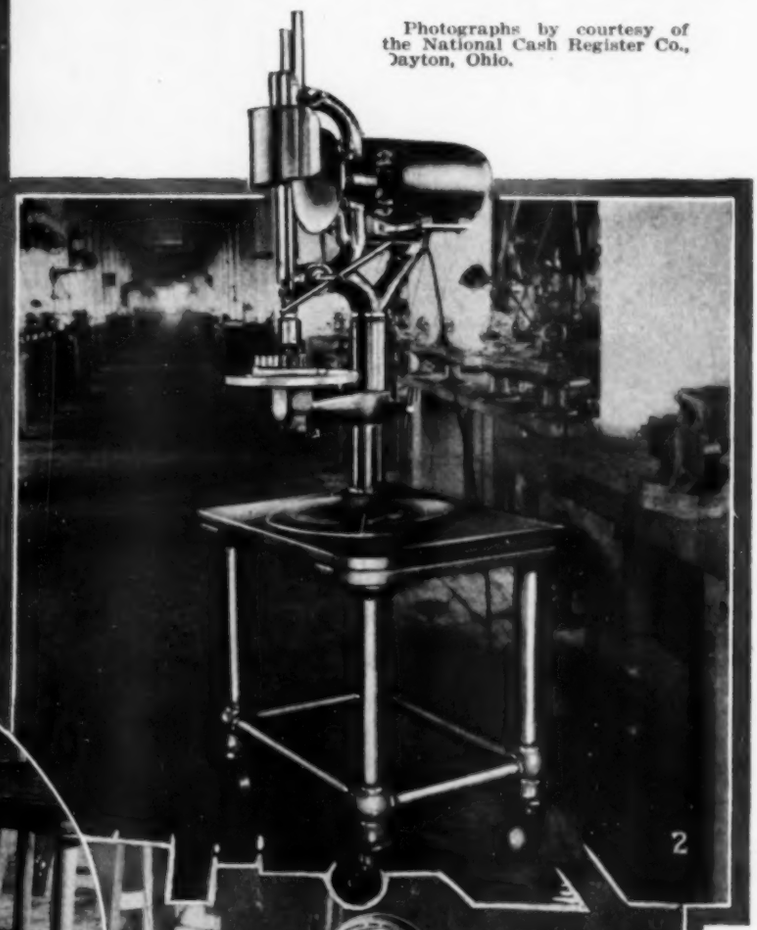


Fig. 2—Another portable machine that handles a similar class of work. It is also applicable as a filing machine. A friction drive operates the spindle

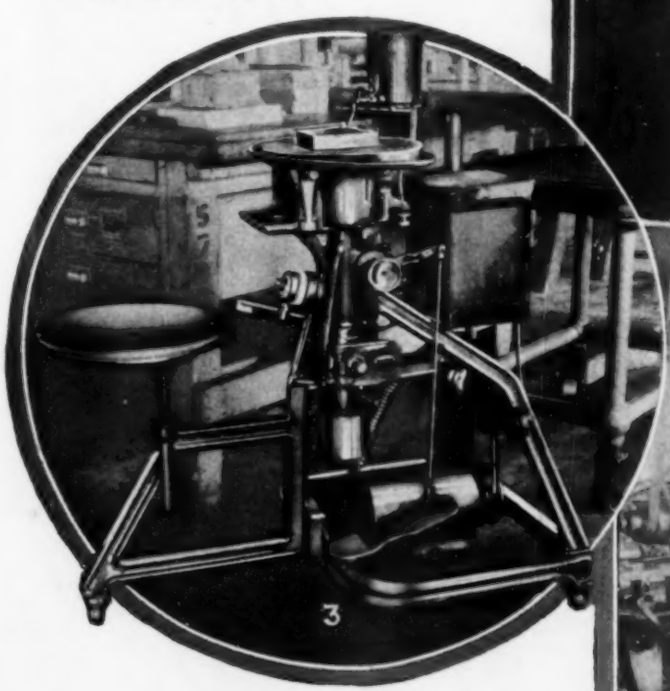
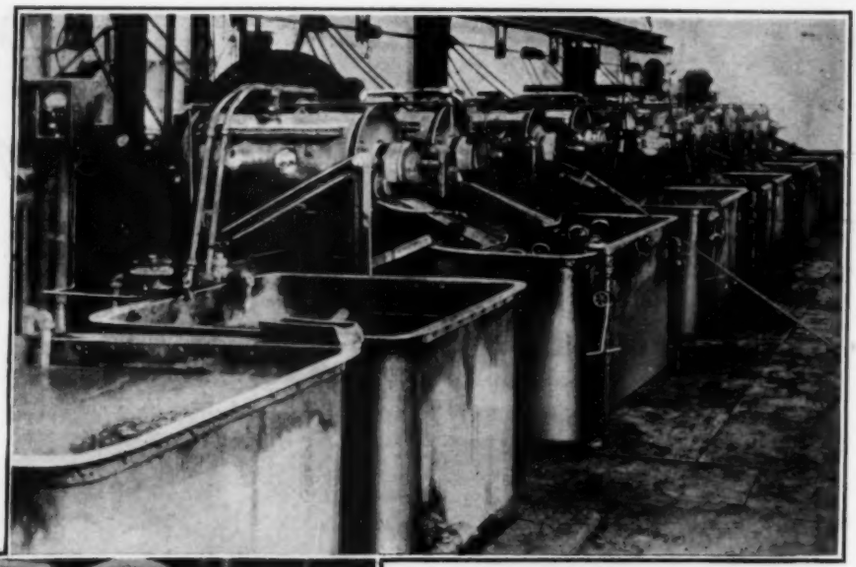


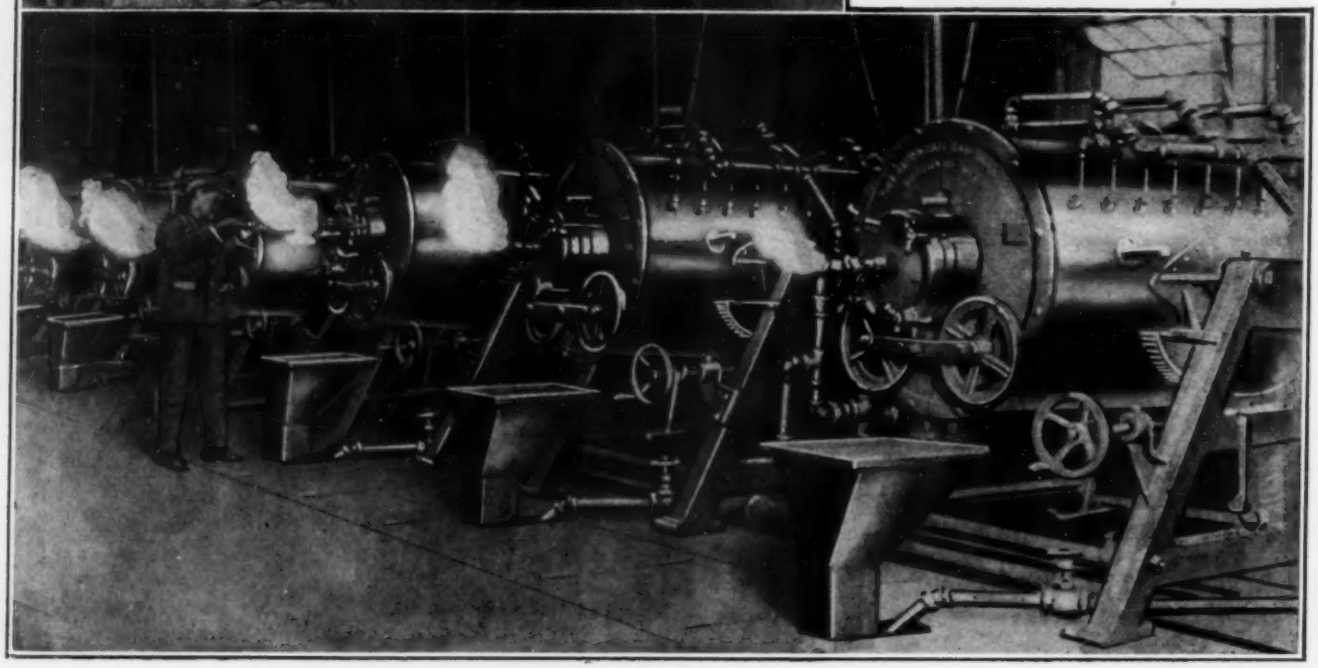
Fig. 3—Stoning machine for miscellaneous die work. The frame is conveniently designed so that the operator can perform minor bench operations in connection with his work without leaving his seat

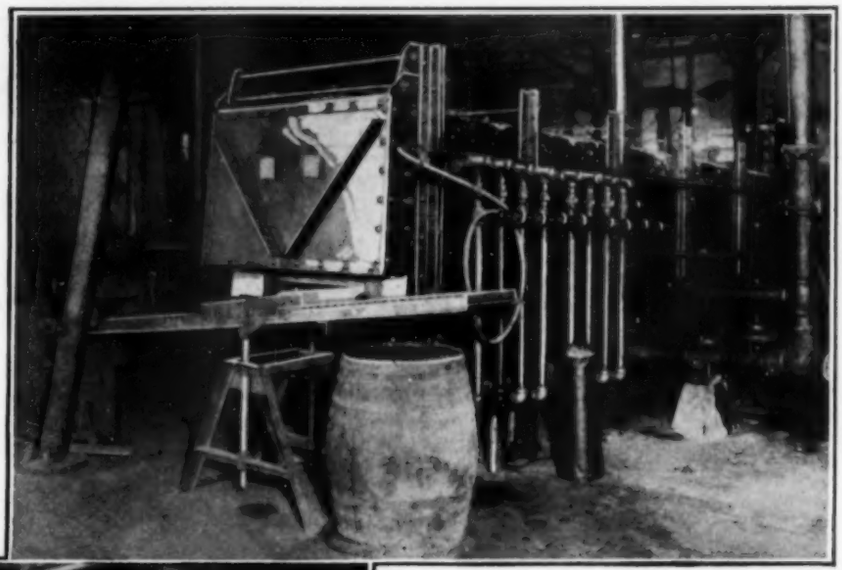
Fig. 4—A portable bench-type band saw mounted on a truck equipped with casters. An individual motor drive is utilized, being provided with a cord that can be connected to a convenient wall socket



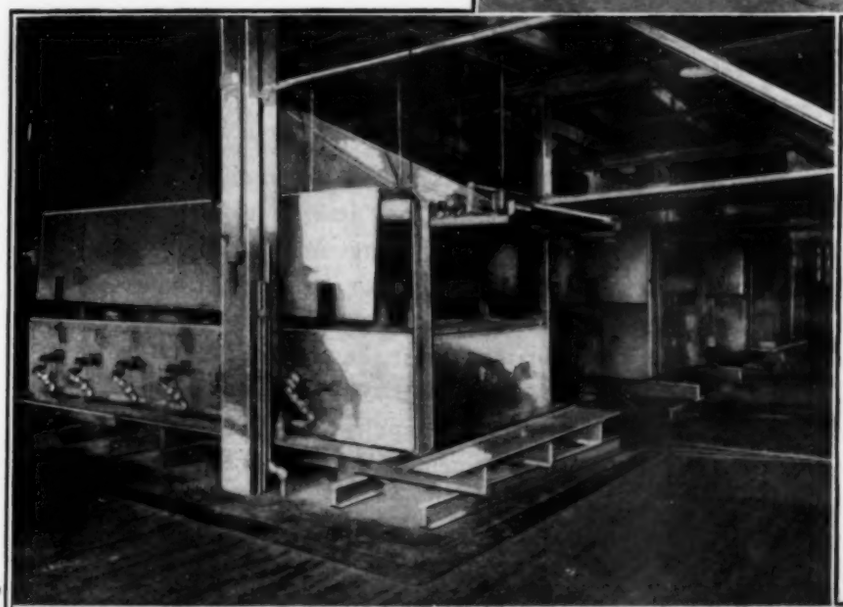
At the right is shown a group of rotary gas furnaces with quenching tanks for carburizing small sewing machine parts. Another type of rotary furnace is illustrated in the center on production work in an agricultural implement plant, and at the bottom is shown a battery of large-capacity rotary carburizing furnaces for quantity work in a locomotive shop

Production Methods Applied in Heat-Treating





At the right is shown a continuous heating furnace for bars. The hot bars from the furnace are fed down the roller conveyor to the drop-forge press, and the press operator gives complete attention to the forging operations



At the left is illustrated a battery of continuous wire-annealing furnaces. The strands of wire pass from the front and are rewound at the rear of the furnace

Below is shown a tool department heat-treating room for the heat-treating of small tools on a production basis. Features of this room, besides the control of the heating, are the good ventilation, exhaust system, and adequate inspection benches

THE · FOREMAN'S · ROUND · TABLE

What Is the Foreman's Job?

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

SILENCE hung heavily over the two men as Al and Ed broke away from the group of foremen coming somewhat dazedly from the superintendent's office. Al's silence was thoughtful but Ed's seemed more the result of grim repression of his outraged feelings. When they were well out of earshot of the rest of the men Ed suddenly exploded.

"For the love o' Mike, what will they be asking us to do next?" he stormed. "Haven't we got enough paper work to do now without asking us to sit down and write out for them what we think our jobs are?"

"Enough to do, all right," agreed Al. "But, look here, ever since the Big Chief sprung his surprise on us, I've been wondering what I was going to put down. The more I think about it, the more things I remember that I have to see about, and I just don't know where to begin."

"Well, it won't take me long to tell 'em," growled Ed. "All I do is see that my department get its work out."

"Wait a minute, you old fire-eater. What about checking the quality of parts as they come to you, and as they go on to the next man? How about seeing that your men obey the safety rules? And get in on time? And get raised when they deserve it?"

"Oh, let the management do that. That's what they're paid for," returned the unconvinced Ed.

"But that's just the point, Ed. As a foreman you are part of the management, and most of the company efficiency depends on the management. Wasn't that what the Big Chief said? You know, Ed, he must take this thing pretty seriously or he'd have left it to Williams to handle. Wanted us to get the idea that this job analysis, as he calls it, is going to make a lot of difference to the company as a whole. That organization chart he showed us is certainly an eye-opener. They'll get my story but it won't be this week. I want to think about it."

"Well, I don't. They're going to get mine this afternoon, and it'll be short and sweet."

Is Ed right in his conception of his job?
Will it do any good for a foreman to sit down and write out the things he does?
Is an organization chart of any interest to foremen?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Receiving the New Man in the Shop

THE first days in a shop for a new man are extremely important in formulating his attitude toward the organization. As I see it, the importance of them cannot be overemphasized; for, it is then that his attitude toward the organization is formed, and on this depends whether he regards his employment as a mere job, or whether he becomes enthusiastically loyal t the company. Therefore, since it is obviously unpractical for the foreman to give much of his time to the new man, it would be well to assign him to one of the older men, whose loyalty is beyond question. In justice to the older man selected, it must be recognized that his production will drop while he is engaged in this "missionary work," and he must not be made to suffer in any way for it. The older man will be expected to take upon himself the explanation of the routine and system of the shop, the equipment available, and the method of obtaining tools from the crib. In other words, he should "father along" the new man, keeping him under his immediate guidance, and keeping him away from the harmless "crabs" which every shop has, and who can have such a harmful effect on the morale of a new man, though perfectly harmless in themselves when they are known and understood. To give him a job and let him work out his own solution is hardly fair, as he will often come to grief, not through any lack of practical knowledge concerning his trade, but due to his ignorance of routine and prevailing practice in the particular concern. I believe it's better to leave him under direct supervision until he becomes familiar with his new surroundings and with a few of his fellow workmen.

—LOUIS C. GAMBONE.

Using Makeshift Tools

I CANNOT help but comment on the aptness of the article on "Using Makeshift Tools." We, in America, pride ourselves on our forward-look—in fact, we rather look down on the rest of the world as being extremely backward while we are up and coming. Perhaps the conceit is justified, but there are too many manufacturers who are perfectly willing at the present time to use antiquated methods, methods which have been out of date for a generation, methods also which have cost them many times the cost of replacing with up-to-date apparatus.

Management is too prone to allow subordinates with an insufficient knowledge of progress in their particular field to determine on their purchases of equipment. We have within a generation gone from the management which insisted on doing everything from designing the apparatus to opening the morning mail to the other extreme of management which reads a monthly report and plays golf, depending on insufficiently trained subordinates to make most of their decisions.

—J. F. LINCOLN, *Vice-President.*

Tool Sales in the Shop

I FIND that an employee will do better work with his own tools as he gets the "feel" of them, and they virtually become part of him. Also, less time is lost in the shop on a special job as a man can go to his tool box and get the tool he wants instead of making a trip to the toolcrib and incidentally swapping some gossip. This applies more to the mechanics than to routine workers who are on the same job day after day. These jobs do not require any great number of tools, but do sometimes require special tools. Obviously it is the company's duty to furnish these special tools. It is necessary that these routine workers be supplied with their tools, since for the most part they are unskilled, and are without tools of any kind. The mechanics are the boys who want their own tools, and appreciate a chance to buy the tools they need at a discount. Three or four trips to the toolcrib will take more time than the time spent in ordering the tool in the first place, and the man knows that it is there when he wants it. Also the interest on a stock of tools is cut down. Then there is also the occasional loss of tools through pilfering. To guard against pilfering sometimes costs more than what the losses amount to. Also, I am suspicious of a first class mechanic who does not have tools, stating that where he worked the tools were furnished. When a man backs up his statements with a heavy tool box I am certain that he is not just a floater and will stay.

—CHARLES O. RANKIN.

FOSTERING pride of ownership among the skilled mechanics with respect to their tools is a very commendable undertaking for any concern. In a small community, I believe this can be best accomplished by permitting the men to buy their tools directly from the company at cost. I think the company should sell at absolute cost price, absorbing the handling and other incidental charges itself as an indication of its interest in the men's attitude. In larger communities, I believe the same objective might be accomplished by a working arrangement with a large retailer or wholesaler whereby the mechanic could purchase directly at a fixed discount upon presentation of a company badge or other identification.

THE · NEXT · TOPIC

Insurance and Savings in the Shop

ADVANCE QUESTION

Granting that employer and employee have common interests for the best part of the twenty-four hours of the day, should the employer interest himself in insuring the workman and his family against sickness and old age?

This would naturally allow a greater latitude in choosing, and would give the mechanic fuller opportunity to exercise his personal judgment. —EDWARD R. MILLER, JR.

IF MEN would rather work with their own tools than with the company's they should be encouraged to do so. Mechanics can do better work if they have their own tools, because they have a pride in them. When a man has his own tools, he will keep them looking well and always in place where he can lay his hands on them when needed. If he is using the company's tools, he often doesn't care whether the tools are looking well or put in their proper places. The company can afford to buy the mechanics' tools for them, and will be saving by doing so, both by saving lost tools and time. So I say that all mechanics should own their own tools, because it adds to their self-respect, and incidentally saves the company time and money. —M. V. DUMIRE.

EVERY mechanic should be encouraged by his employer to be the owner of a good kit of tools, as men who own high grade tools, almost without exception take a pride in their work, and the craft as well, that is frequently lacking among those who have not assumed the responsibility of purchasing and caring for a good set of tools. Anything that can be done by an employer to lessen the cost or reduce the trouble in securing tools for the mechanic is appreciated, and the cost is more than offset by the better care that the company's tools are sure to get while in the hands of the workman.

—MARTIN H. BALL.

Consulting the Foreman on Tool Design

UP TO a certain point the idea of consulting the foreman on tool design is good. But to make a nabit of running to the foreman with every drawing is an admission of incompetency on the part of the designer. If the tool designer has not had a wide experience he should not be on the job. As to the point of a workman approving and signing sketches, our friend Al must have a keen sense of humor. I doubt if some of them could read the drawings. Co-operation is essential, with common sense on both sides, but no string of signatures is necessary on any drawing.

—RICHARD HAZELL, *Draftsman, England.*

Is the Company Picnic a Good Thing?

OUR attention has been called to articles which have appeared in the *American Machinist* recently on the subject of factory picnics, so it occurred to us that you might be interested in knowing of the American Art annual picnics.

Coshocton Lake Park is taken over for the day by employees and their families. It is estimated that 2,500 people attended the picnic this year. The picnic dinner is furnished by the employees, and the company adds free coffee and ice cream. Everything is free to employees—boating, bathing, dancing, and other amusement features.

In the field events there are picturesque drills by a team of men and a team of women, a hotly contested ball game between North and South plant employees, and many contests for grownups and children. This year there were stunts, including a colorful Spanish bull fight, old-time costume parade, and other interesting numbers. In the evening there was a big dance, also two of the popular calendar subjects in our line were reproduced by living models posed on a boat in the lake, the lighting being done by a huge spotlight.

The heads of all committees are employees. Foremen serve on committees, but are not in charge. Each year the picnics are a greater success. Before and after the event a special paper called "Highjinks" is published to carry picnic news, and an elaborate program is printed for the events. —A. MCCARTAN.

Looking Beyond the Department

I THINK the Big Boss was doing the right thing in calling the attention of the foreman to anything he thought was wrong, but I would add that to my mind the ideal policy of every big boss when out on his shop trip should include seeing and acknowledging those things that are going well. My job as foreman compels me to get after the things that I see wrong, and incidentally, I find it most profitable to give credit where it is due when I see things going well. It is this policy of recognition that keeps things running smoothly. Moreover, teamwork for the firm demands that the foreman look beyond his department and help his fellow foremen all he can.

—C. L. HENRY, *England.*

THERE are always two sorts of men in every shop; those who go on day after day getting their time over as comfortably as they can, and those who are true engineers with active brains, studying the why and wherefore of everything. It is not natural for the good man to stand still, or not to think. He must be doing something to further the interests of his employer and his fellow men. And so it should be with every foreman. He will see to production and get it at the minimum cost, and interest himself in the finished product, even so far as selling it. He should also interest himself to the extent of improving the product and widening its field by introducing new ideas.

—H. MAPLETHORPE, *England.*

Abolishing Private "Mikes"

UNDOUBTEDLY Bill was responsible for his work being too large. He should have checked his "mike" periodically against standard gage blocks, or failing this he should have had the first one or two of the parts inspected. He would then have found out his error without wasting any more time. Williams was wise in doing away with the private "mikes" and furnishing the shop with them, in fact, it would pay him to furnish all tools of precision such as vernier calipers and protractors. He should also arrange for the toolroom to check and correct them periodically. Al was right in that the majority of foremen fail to inform new men of shop facilities. A small sum spent on instruction sheets relating to the respective shop methods would be money well spent. It would help to pay for many a scrapped job, and also for much lost time when men are doubtful as to how to proceed with the work. —J. WILSON, *England.*

Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

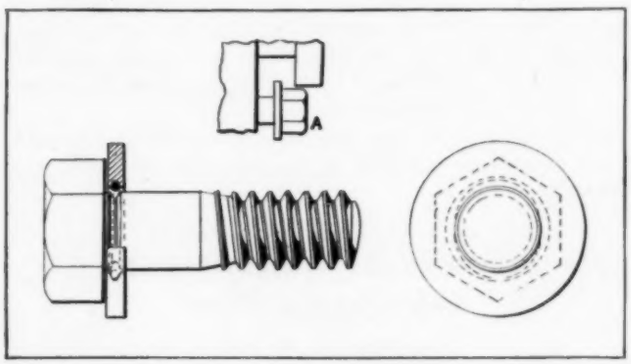
Washer Removably Attached to Screw

By Henry Simon
Jena, Germany

There are cases where it is desirable to have a washer that cannot drop from its screw, and yet where it is impossible or impracticable to press or otherwise rigidly fasten it in place under the screw head, because it would be in the way of removal.

In the illustration is shown a washer that cannot possibly drop off of its screw, yet can be easily removed from the screw whenever desired. The idea is simple, and can be applied to any screw and washer so long as they are still soft. As will be seen, the shank of the screw under the head, and the inner face of the washer are each provided with a V-groove. Into the groove in the washer is sprung an oval-shaped piano-wire ring, so made that while it firmly seats in the washer, it will pinch the sides of the groove in the screw shank. The dimensions of the groove in the washer and of the wire, must be such as will allow the washer with the ring in place to be slid over the shank without difficulty. The groove in the screw should be a slight distance away from the head, as shown, so as to make sure that the ring will always seat on the screw shank.

Since the depth of the groove in the screw is about the same as that of the thread, the strength of the screw is not diminished, so that no disadvantage of any kind is incurred to offset any part of the advantage gained. The advantage is often considerable, for it is out of the question to lose the washer. Anyone who has ever dropped a washer into the working parts of some complicated machine, or lost it when it was needed in a hurry, will know how much the dropping of a washer may mean.



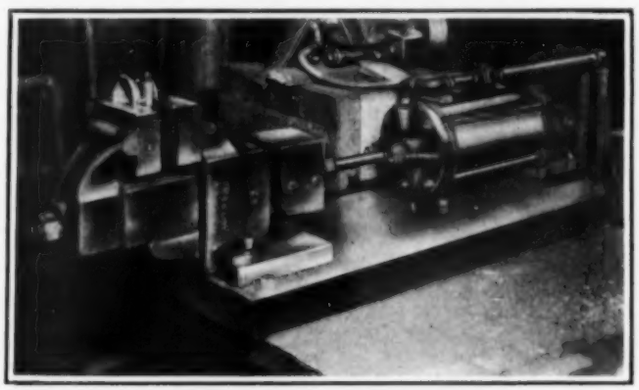
The washer and the screw

At *A* is shown one out of many cases where an overhanging part would not permit the use of a pressed-on washer, but where the removable washer, while always in place, is never in the way. As soon as the screw has been loosened a few turns, the washer is slid on the shank. From there on, as the screw is turned, the washer will either jump over successive threads, or the threads will turn through it, and the washer will be left on the threaded end when the screw is out.

An Air-Operated Vise

By Herbert F. Crawford

There is frequently more time lost in opening and closing vises than we realize. The accompanying illustration shows how the connecting-rod department of the Marmon Automobile Co. handles the vise used in holding the connecting rod while the nuts are being screwed on the connecting-rod bolts in assembling the caps.



Air-operated vise in the Marmon plant

A Hanna air cylinder is mounted on a block behind the vise, as shown, the piston rod being connected to the bar of the vise. The operation of the air cylinder is controlled by the operator's foot, leaving both hands free to handle the connecting rod. The time saving has proved very satisfactory, and there are many places where a similar application will prove an economical investment.

Cutting a Belt to Narrower Width
Discussion

By J. H. Slater
Montreal, Canada

In an article by Arthur Kendall under the title given above, published on page 322, Vol. 67, of the *American Machinist*, the method described is very good, but it takes considerable effort to press the knife into the belt and to hold it during the cutting operation.

An easier way is to take a board about 6 in. wide and to cut a groove in it equal to the width and thick-

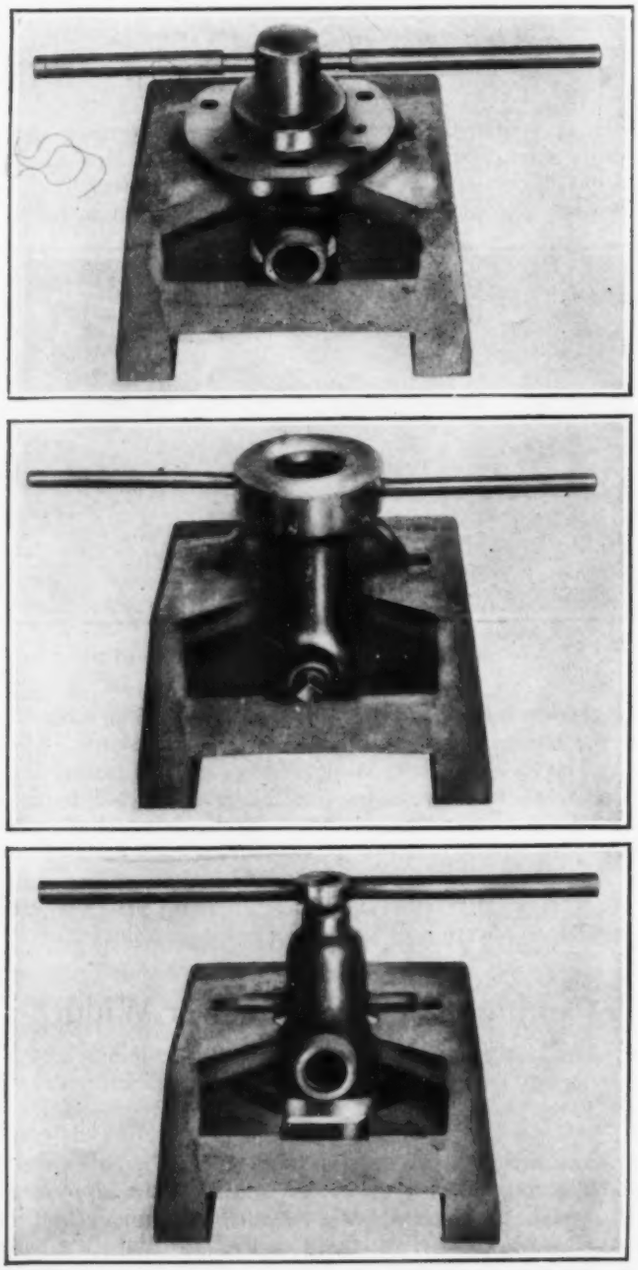
ness of the belt to be cut. Mark a point at the bottom of the groove where the edge of the narrowed belt will come, and sink a knife into it. Nail on a thin board for a cover, force the knife blade through it and into the place where it was sunk in the groove, and push the belt through. When enough of the belt comes through to give a good hand-hold, grab the end and walk away.

The groove holds the belt in place, the cover holds it down, the knife cuts it, and the job is done. Of course, the whole arrangement must be held in a vise.

Fixtures Without Clamps

By William C. Landis

While fixtures in which the work is required to be clamped, have their uses, there are many instances where they can be so designed as to hold the work without clamping, especially if they are to be used on the bench.



Non-clamping bench fixture for holding work of two sizes in three positions

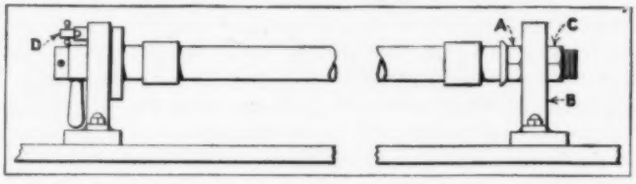
The illustration shows a bench fixture for two sizes of parts for triple valves of air brakes. The parts can be held in three positions in the same fixture as the illustration shows, and no clamping is necessary. The operations to be performed are: hand reaming, rethreading, and screwing in a pipe plug.

The fixture is of cast iron, and the only work done upon it was planing the bottom, and drilling and tapping two holes for the bolts for attaching it to the bench.

Machining Front-End, Main-Rod Brasses

By J. H. Hahn

The illustration shows a fixture for machining the square faces of front-end, main-rod brasses for locomotives in lots of twelve or more, depending upon the length of the mandrel and the size of the machine on which the work is done. First the brasses are machined on the joint faces and are sweated together. Then they are rough bored, faced on the sides and placed on the



Indexing fixture for main-rod brasses

mandrel, being tightened up by the nut *A*. The end support *B* is then placed in position and the nut *C* is screwed up against it to keep the mandrel from turning.

The fixture is provided with an indexing arrangement at *D*, so that when one face of the brasses has been machined, the next face can be brought into machining position. In indexing, it is necessary to loosen the nut *C*, and to tighten it after the indexing has been completed.

If the fixture is used on a planer having a side head, two sides of the brasses can be machined at the same time. If a planer having two heads on the cross-rail and two side heads is available, two of the fixtures can be used. Where brasses are to be made in large lots, a duplicate mandrel can be provided, so that one mandrel can be loaded or unloaded while the brasses on the other one are being operated upon.

While the fixture was designed to be used on a planer, it can readily be adapted to be used on a shaper or a milling machine.

Fixtures for Machining an Odd-Shaped Piece

By Frank Waldo

The illustrations show a boring and turning fixture used in connection with the manufacture of disk valves for oil burners. Prior to the construction of these fixtures, trouble was experienced in obtaining correct relations between the faces machined. For the first operation, the valve is placed in the fixture, shown in Fig. 1, centrally located by the stationary V-block *A* and the adjustable V-block *B*, while the end is located by the surface *C*

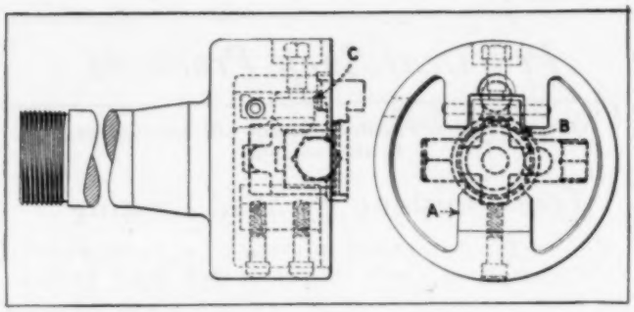


Fig. 1—Boring fixture for a disk valve

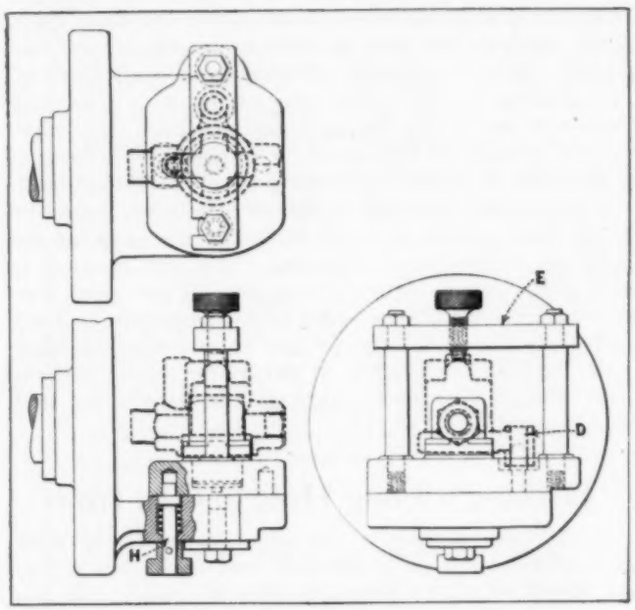


Fig. 2—Indexing type fixture for turning two ends

striking the body of the fixture. This means of location aligns the work uniformly for boring, threading and facing of the large end.

Using the faced surface as a means of location, together with the hole *D*, drilled between the operations, the work is placed on the indexing fixture illustrated in Fig. 2, in which it is turned and threaded at the ends. The swinging clamp *E* holds the work rigidly in place on the revolving member of the fixture. Indexing is done in the usual manner, the index pin being shown at *H*. A relatively low production is required, yet the work produced must be accurate, therefore, the fixtures represent simplified forms of tools that fulfill the requirements.

The fixtures can be used either in an ordinary lathe or in a turret lathe.

What Is a Floating Holder—and Why?
Discussion

By George Wilson

I was much interested in Robert White's article, published on page 1099, Vol. 66, of the *American Machinist*, anent the floating reamer shank. I have often tried to dope out a floating reamer holder that would float, and at the same time permit the reamer to go through the hole in line with the bore of the piece to be reamed, but so far I have not seen or been able to devise a rig that was right theoretically.

Practically, however, it is possible to make a holder that will take care of slight misalignment of the machine. What Mr. White says about our old friend the shank in a collet, driven by a cross-pin, is true; yet, like the Ford car, the darn thing works, though it ought not to.

Most machines are out of alignment by having the spindle low, because of wear. On an old machine, the bed close to the spindle will also be worn down, and the slide of a turret lathe, having practically no bearing ahead of the turret, will be down.

It will be noted that when presenting a reamer to the work in such a machine the shank will spring, or, if the shank is too stiff to yield readily, the reamer will cut upon one side and the hole will be bell-mouthed. A floating holder will allow the reamer to enter the hole without springing the shank, but what is going to hoist up the other end of the shank?

Some holders provide a ball between the shank and the end of the collet, presumably for the shank to roll up on and get in line with the hole, but I cannot conceive of any holder that will actually put the turret end of the shank in line with the work if there is any weight to the shank. Then, too, if the spindle end is down, what is the use of hoisting up the shank? The reamer will go through at an angle anyway.

I once went through one of the largest gasoline engine plants in the country, where a great many engines of the agricultural type were turned out. There was a huge four-spindle, vertical boring machine to bore the cylinders. In this machine I noticed that the reamer, about 5 in. in diameter, was mounted upon a shank 4 in. in diameter by some 2 ft. long, the shank dangling from a cross-pin in the collet. The superintendent told me that they had tried everything to hold the bores straight and to size, and that the cross-pin was the answer. It didn't look right, but it was doing the business.

The proper way to make a cross-pin holder is to make the shank a snug fit in the bore of the collet and drill the hole for the cross-pin with the parts assembled. The desired amount of float is then given by turning off the shank and enlarging the pin-hole. The edges of the hole in the shank should be chamfered slightly. Obviously, the shank should not be allowed to bottom in the collet when drilling the hole for the cross-pin.

A Heavy-Duty Collet Chuck
Discussion

By Edwin Kilburn

On page 1098, Vol. 66, of the *American Machinist*, R. L. Wood, Jr., described a chuck that appears to be a very practical device. I am prompted to discuss the matter only because of the fact that we have, within the past few months, put into use a chuck somewhat similar to the one in question, but one that we believe is to be preferred, for certain reasons.

The chuck as applied to the lathe, together with the collets used and the chuck-body nut, is shown in Fig. 1. We make use of a pin spanner-wrench instead of a pin wrench applied to the face of the nut. Both the body and nut of our chuck are made of cold-rolled steel, and the taper of our collets is carried entirely inside the chuck body instead of one end being in the nut, as in Mr. Wood's chuck.

The construction of our collets is shown in Fig. 2.

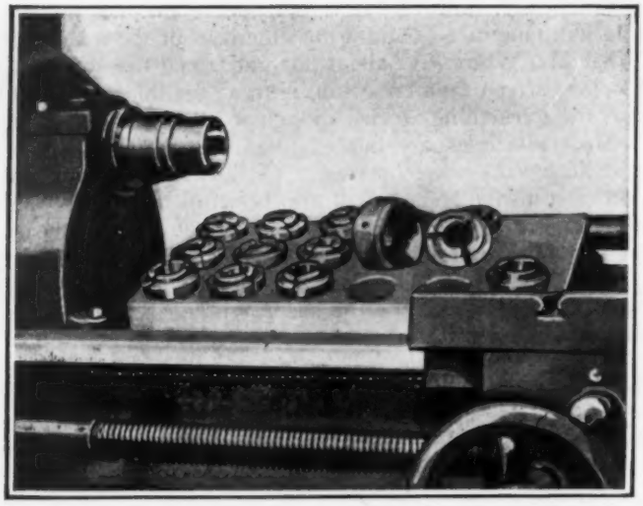


Fig. 1—The chuck as applied to the lathe

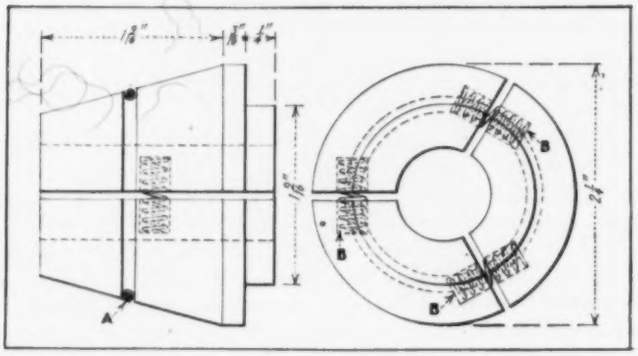


Fig. 2—Constructional details of the collets

They are made of cold-rolled steel and are split clear through in three directions as shown. Between each joint is placed a spiral spring located in a pocket drilled in the flat faces of each collet segment. The whole collet assembly is kept together when removed from the chuck body, by a stiff, split ring of spring steel located in the groove *A*. At *B* are the spring pockets.

The construction provides a collet having a range of 1/16 in. or more, which is desirable in many operations. The included angle of the taper of the collets is approximately 30 deg., which makes the chuck self-releasing but still provides ample gripping power.

A Serial Number with a Meaning
Discussion

By H. K. Pinkerton

I AM in sympathy with the method of numbering mentioned by Arthur A. Merry, on page 563, Vol. 66, of the *American Machinist*, with perhaps one clarifying change.

Since there can be only two digits in the numerals set aside for the months of the year, and since it is possible for only one digit to be used, all chance of error or confusion may be removed by using zero before the months represented by the first nine numerals. Zero is just as much a digit or numeral as any other of the nine digits used in our numerical system. It has a perfectly definite meaning, standing at the beginning of a series, or at the end, or in between either these extremes. We use a system similar to the one Mr. Merry mentions, but with full recognition given the humble zero.

Practical Shop Problems

Questions of a Practical Nature will be answered in this column

Tool Finishing by Mud Blasting

Q. Can you give us any information as to the process of "mud blasting," used to give a dull finish to tools such as to the inside of the flutes of drills? Is it simply wet sand blasting?

A. Little, if anything, has been published on this subject, and we understand from one of the large users of the method that it is an entirely special process, requiring special machinery, distinct from sand blasting. The material used is white clay mixed with a varying amount of sand from the sand-blast machines. By varying the amount of used sand, it is possible to increase or decrease the amount of cutting done by the mud blast. The mixed clay and sand is thrown through a nozzle by an air blast, which is in all essentials the same as the nozzle in a sand-blast machine. The wet mixture is quite fluid, and is returned to a trough and used continuously, fresh material being added from time to time. Essentially, however, the process is wet sand blasting, since "mud" is a mixture of earth and water, and the name does not properly apply to the hard silica sand mixture used.

Drilling a Long Hole in Cast Iron

Q. We are making a cast-iron sleeve, 13 in. long, used as a bearing on a windmill, and which has a 1-in. hole bored through. This hole must be straight and true to size. What drill or tool would be best for drilling, and what size should the core hole be to get the best results?

A. The best way to prevent the drill from running out of line on long hole drilling is to revolve both the work and the drill. The 1-in. hole in cast iron can be cored to ¾ in., leaving ⅛ in. all around for drilling. A core drill, or a straight fluted drill, should be used. When the work and the drill both revolve in opposite directions there will be no likelihood of the drill running out of true. To insure a hole true to size it should be finished by reaming. Care should be taken, however, not to leave too much stock for the reamer to remove, if a good finish is required.

Marking Drill Shanks

By Edwin D. Anderson

WHY can't the makers of straight shank drills mark the size or number up closer to the flutes so that they will not become worn out so easily? How many times have the users of straight shank drills picked one up only to find the size obliterated by some previous user letting it slip in the drill-chuck, and making it necessary to use a drill gage or micrometer to determine the size? Most drills are stored in drawers or bins and are supposed to be in their proper places, but no mechanic will use a drill unless he knows for himself that the drill is the correct one, and the easiest way is to look at the size on the shank. It would seem that this point could easily be corrected by the makers.

Characteristics of Stainless Steels

Stainless steel is essentially a steel containing an appreciable amount of chromium. It was first produced in America in 1914, under the Brearley Patent. This original composition, of which a typical analysis is: Carbon 0.35 per cent and chromium 13.5 per cent, still finds its greatest use in the cutlery industry, and is designated as Sterling "Type A" stainless steel. As supplied from the mill, it has a Brinell hardness of 325 and is machinable. In this condition its tensile strength is about 150,000 lb. per sq.in. minimum, with a minimum elongation of 12 per cent, and a reduction of area of 40 per cent. When hardened by oil quenching at 1,750 deg. F., and drawing at 450 deg. F., it has a Brinell hardness of about 500, with a tensile strength of 240,000 lb. per sq.in., minimum, an elongation of 4 per cent, and a reduction of area of 8 per cent. When air-cooled from 1,825 deg. F., and drawn at 450 deg. F., its Brinell hardness is about 450, and its tensile strength is 220,000 lb. per sq.in., minimum, and elongation of 6 per cent. When hardened, ground and polished, this steel has great resistivity to corrosion.

The success of stainless steel in the cutlery industry led to its adaption for various uses in the entire field of manufacturing. However, the fact was soon apparent that the application of one type was incapable of meeting all the requirements of many various purposes. Modifications had to be made to improve certain physical properties or to overcome limitations. The dental and surgical instrument industry called for a stainless steel capable of greater hardness. To meet this demand, another type was developed in which maximum hardness is obtained with a loss of some of the corrosion resistance by increasing the carbon content of the original "Type A" and keeping the chromium content the same. A typical analysis of this steel is: Carbon 0.80 per cent, chromium 13.5 per cent. This type of steel is also used for scale pivots, ball bearings and ball races, and other parts requiring extreme hardness. Stainless steel of this composition is forged at temperatures between 1,700 and 2,000 deg. F., and is annealed at from 1,625 to 1,675 deg. F. It is hardened at a temperature of from 1,800 to 1,900 deg. F., and the temper is drawn to meet the requirements.

To meet further the requirements of cutlers, another stainless steel was developed, which has both a high carbon and a high chromium content. This steel, which was designated as "Type B," has a typical analysis of: Carbon 0.65 per cent and chromium 16.5 per cent. The heat-treatment of this steel is practically the same as that for the 13.5-per cent chromium type, but its Brinell hardness, when hardened, is somewhat lower, being about 550 as compared with 625 for the 13.5-per cent steel.

All of these types of stainless steels require heat-treatment, with subsequent grinding and polishing, to obtain their stainless qualities. The call for a stainless steel that would eliminate the necessity for hardening and grinding, led to the development of still another type which is stainless without heat-treatment, is readily machinable, and has exceptionally good physical properties. A typical analysis is: Carbon 0.10 per cent, chromium 12.5 per cent. This stainless steel is used for steam turbine blades, and for such machine parts as pump rods, shafts, and soldering points. While heat-treatment is not necessary to develop stainless properties in this steel, the physical properties can nevertheless be improved by oil quenching at 1,800 deg. F., and then drawing at various temperatures up to 1,100 deg. F. The hardness is greatly influenced by slight variations in drawing temperatures. As supplied from the mill, this stainless steel has a Brinell hardness from 200 to 240, and a minimum tensile strength of 100,000 lb. per sq.in., with an elongation of 20 per cent and a reduction in area of 60 per cent, minimum. When oil quenched from 1,800 deg. F., and drawn at 450 deg. F., the steel has a tensile strength of 190,000 lb. per sq.in., minimum, with an elongation of 15 per cent, minimum. Drawing at 1,100 deg. F. reduces the tensile strength to 150,000 lb. per sq.in., but increases the elongation to 20 per cent. When annealed, this 12½-per cent chromium steel is readily machinable.

All of the standard chromium stainless-steels can be forged, but to meet the requirements of manufacturers of drop forgings, a soft malleable type of stainless steel was developed which could be formed into intricate shapes with approximately the same ease as low-carbon steel, and which does not possess the air-hardening properties common to the other types. The stainless steel developed to meet the requirement contains about 16 per cent of chromium and 0.08 per cent of carbon. This steel can be forged readily, and is highly resistant to rust and corrosion. It is forged at a temperature of 1,600 to 2,000 deg. F. It can also be hardened if required by quenching from a temperature of 1,775 to 1,825 deg. Fahrenheit.

For the information given we are indebted to the Firth-Sterling Steel Co.

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Technical Abstracts

Measurement of Taper Fittings

There is a complete lack of standardized practice in dimensioning tapers. Some give the dimension at the large end, others at the small end, and a few in the middle. In the case of a keyseat on a tapered shaft, the taper cannot be measured from the side of the keyseat, since the angle at that point is not parallel with the taper itself on account of the variation in diameter.

The White Motor Co. uses the method shown in Fig. 1, although not claiming it is original. It will be noted that a dimension with no tolerance is shown

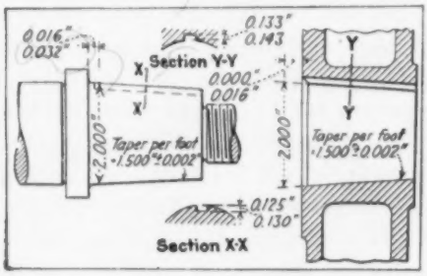


Fig. 1—Proposed dimensioning of taper parts

for the diameter. This is known as the basic diameter, and is located by a dimension with a tolerance from some pertinent fixed point. This method is based on the principle that somewhere on the tapered surface this basic dimension will occur, and this point will locate the relative seating of the two mating parts. The basic diameter should be identical in both components, and should be located from the surface that is most vital in the final assembly, or from a surface that is available during machining. This makes it possible to visualize the relation between the two parts.

Referring to Fig. 1, we find that the 2-in. diameter falls 0.016 to 0.032 in. from the flange on the shaft. This provides a linear tolerance of 0.016 in., which corresponds to a tolerance of 0.002 in. on the diameter. On the hole, there is a linear tolerance from flush to 0.016 in. out from the hub face. The extremes of these conditions leave a space of from 0.016 to 0.048 in. between

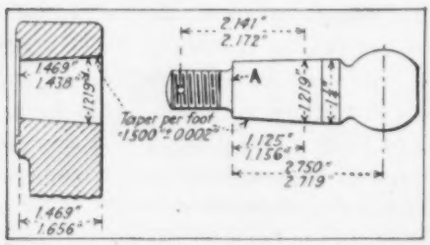


Fig. 2—Taper dimensioning from small end

the flange on the shaft and the face of the wheel hub, which gives 0.002 to 0.006 in. interference on the taper after the two parts are drawn together by the nut. The figures given in these illustrations are arbitrary and should not be taken as indicative of recommended fits. Each problem requires individual consideration as to that. The proposed method of dimensioning the depth of the keyseat is also shown in Fig. 1, and gives all the information required by the machinist.

In Fig. 2 is a case where we are especially interested in the space left between the shoulder on the small end of the stud and the nut or washer face. The cotter-pin hole may be located either from the basic diameter, as shown, or from the shoulder *A*, depending upon the sequence of the machining operations. When parts are to be assembled in definite relation without being pulled up hard against a shoulder, an assembled drawing must be provided to show the required position.—H. S. KARTCHER, *S.A.E. Journal*, September.

The French Airways

The network of French air line is placed geographically directly between those of Germany and those of England. The German airways consist of a great number of lines covering the whole Empire, but only a few reaching out to the principal cities of neighboring countries. In England, the lines confine themselves to connecting up the principal cities, and with a line from London to the mainland. The French lines, however, are international, and, moreover, they are not in the hands of one company, as in Germany or in England.

The French companies operating air lines are: The Air Union, the General Air Transport Co., the International Aerial Navigation Co., and the General Aeronautical Enterprise Co. The first of these operated 894,000 km. in 1926, and has lines from Paris to London, Lyons, Marseilles, Geneva, Ajaccio, and Tunis. The second company operated 392,000 km. in 1926, and has lines from Paris to Amsterdam and to Berlin. The International Aerial Navigation Co. operated 1,452,000 km. in 1926, with lines from Paris to Prague, Vienna, Constantinople and Warsaw. The General Aeronautical Enterprise Co. operated 2,469,000 km. in 1926, and has lines to Toulouse, Casablanca, Dakar, Oran and Marseilles.

These lines have twelve airplanes in service. Two of these planes are single motor machines, and three are seaplanes. The lightest plane in service is a Breguet, weighing 2,825 kg. and equipped with a 420-hp. Jupiter motor. It carries 6 passengers. The speed of this plane is given at 125 miles per hour. The heaviest plane in service is an Amiot 150, weighing 7,300 kg., and equipped with three Hispano motors with total horsepower of 1,050. This plane carries 14 passengers, and has a speed of 145 miles per hour. The highest powered seaplane in service is a Besson MB-36, with weight of 7,500 kg., and equipped with three Jupiter motors having a total horsepower of 1,080. This plane carries 14 passengers, and has a speed of 120 miles per hour. —*V. D. I.*, Berlin, Aug. 6.

Many Labor-Saving Devices Applied to Bumper Production

The Badger Manufacturing Co., Milwaukee, Wis., manufacturer of automobile bumpers, employs many special labor-saving devices, most of which were designed by its own engineers.

The bumper bars are made from spring steel, as well as the supporting bars and fittings. The bars go first to shearing machines, where they are cut to suitable lengths. They are then heat-treated and then eyes are formed at both ends. The bars are reheated for the next operation by passing them through a continuous furnace and then placed on a specially designed cambering machine, which bends the bars to the desired curve in a single operation. The workman retains his hold on the bar with the tongs as it is shaped to its final form, and then lifts it to the adjoining quenching machine. It is here placed in a metal carrier on an endless conveyor, which carries it through a vat of oil and deposits it at the entrance to the drawing furnace, which is of the conveyor type.

The heat-treatment leaves the steel with a hard scale which is removed either by sandblasting or by tumbling. The next step is the polishing of the bars. The longer bumper bars are automatically handled by passing them successively under abrasive wheels, each of which is revolved by an individual motor. The bars are fitted to a carriage which is mounted on small metal wheels and drawn beneath the line of abrasive wheels by a chain belt conveyor. After being polished, the bars are ready for plating. They are copper-plated first, then buffed, and finally nickel-plated. Recently an additional coating of chromium has been applied in some instances.

The electroplating department contains the most modern equipment available. Twenty-two vats are provided for carrying on the various cleaning, plating and drying operations. By means of racks, a number of bars are handled at a time. They are moved along the line, lowered into the tanks, and raised

out of them by air hoists mounted on overhead rails. The plated bars are polished on buffing wheels. Parts which are not plated are japanned by dipping, after which they are baked in gas-fired furnaces. Bars of the grooved type are japanned by hand brush after plating and then air-dried.—*Automotive Industries,* August 27.

The Manufacture of Hairsprings

The effect of processes of manufacture and assembly on the elastic properties of hairsprings is of great importance. There are three main types of hairsprings: (1) the straight or torsion type used as suspension in certain electrical instruments and time-measuring instruments having escapements with a very high rate of oscillation; (2) the flat coiled or spiral type used in watches; and (3) the helical type used in chronometers and in certain other scientific instruments. Hairsprings of any type may be made from plain carbon or alloy steels or any other metal or alloy capable of being worked into thin wire or strip with a high elastic limit and fatigue range.

Carbon steel is probably the material most frequently employed. Swedish steel of high quality containing from 1 to 1.3 per cent of carbon and very low in sulphur and phosphorus is commonly used. Quenching in oil from 1,380 deg. F. has been found a suitable hardening treatment and gives a Brinell hardness over 650, which may be reduced to any desired extent by subsequent tempering.

Among the more recently developed alloys, resisting corrosion to a remarkable extent, "Elinvar," containing about 12 per cent of chromium and 36 per cent of nickel, may be mentioned; after suitable treatment it has a practically constant elastic modulous over a very wide range of temperature. Elinvar, like non-ferrous alloys, can only be hardened by cold-working operations. The requisite properties before cold-working are secured by air cooling or quenching from 1,470 deg. F. In order to restore the elastic properties impaired by the cold-working operations, the hairsprings should be heated to temperatures between 650 and 1,100 deg. F., the appropriate temperature and time of treatment depending on the degree to which the Elinvar has been cold-worked.

Phosphor-bronze free from zinc and containing not more than 6 per cent of tin and 0.2 per cent of phosphorous is also commonly used.—H. Moore and S. Beckinsale, *Forging - Stamping - Heat Treating,* August.

Assembling American Automobiles Abroad

The benefits to be derived from assembling American cars in foreign countries are obvious. The most important of these are: The saving in ocean freight by shipping disassembled parts; saving in customs' duty, because many countries assess a lower rate on parts for assembly than on completely set up cars; the ease with which distribution to nearby dealers is facilitated through local assembly; the ability to adhere more closely to local preferences in construction or equipment; and the advantage in many cases of lower cost for labor and materials.

There are now branch American automobile assembling plants in England, Denmark, Belgium, Spain, France, Irish Free State, Argentina, Brazil, Germany, Mexico, Japan, Australia, South Africa, New Zealand, Uruguay, and the Dutch East Indies. Advantage has been taken of the free port facilities in many countries. Such accommodations permit the American manufacturer to assemble his cars at a foreign port without the payment of a local customs duty until the completed car is actually marketed in the country. During the first six months of 1927 the total number of American cars sold in foreign countries was close to 307,000, of which 39 per cent were of foreign assembly. This does not include the product of American branch automobile factories in Canada. Such factories are usually considered to be independent establishments.—Irving H. Taylor, *Commerce Reports,* Sept. 12.

Welded Aircraft

It should be noted as an outstanding fact that all of the planes which made the overseas records this summer were built of steel tubing, and were fabricated entirely by oxy-acetylene welding. Adoption of oxy-acetylene welding by the aircraft industry has been based on several important considerations. Many tests carried on over long periods of time, made by both the Army and Navy aviation authorities and by civilians, have proven that by welding a joint of maximum strength and minimum weight can readily be made under average production conditions. In the second place, the test of service is an indication that these laboratory figures have been amply justified. In a flight made on Nov. 3, 1926, by Lindbergh as an air mail pilot, it became necessary to abandon the plane at a height of 13,000 ft., and the pilot dropped in a parachute. When the wreckage of the plane was discovered the next day, it was found that even after this terrific fall, the metal fuselage was still intact. The importance of this statement is emphasized by the fact that there are on an average between 400 and 500 welded joints in a single plane.

In routine welding in chrome-molybdenum tubing it is possible to attain an ultimate tensile strength of 96,900 lb. per sq.in. The material itself has a minimum tensile strength of 95,000 lb. per sq.in. It is usual in welding chrome-molybdenum tubing in aircraft construction to use high test or mild steel welding rods. The heat of the oxy-acetylene welding has very little effect upon the tubing, this fact being ascribed to the air-hardening properties of the alloy. Where mild steel tubing is also used for some of the parts, it is welded into the chrome-molybdenum tubing with entirely satisfactory results.

Oxy-acetylene welding has not only made possible a stronger and more dependable framework for aircraft, but also has simplified greatly the mechanical problems involved in aircraft construction. The welded joints come nearest to the ideal structure. They eliminate fittings, and make the fuselage frame one single unit of steel.—*Oxy-Acetylene Tips,* Sept., 1927.

Tin Supply for American Consumers

The world's annual production of tin metal is approximately 144,000 gross tons, of which the United States consumes more than 77,000 tons. Of this production, 48,166 tons came from the Malay States in 1926, 32,113 from Bolivia, and 33,006 tons from the Dutch East Indies. The Cornwall mines in England produced only 2,064 tons, and the United States, including Alaska, produced only 12 tons. The economic situation of the United States with respect to tin is similar to that of rubber, that is, the entire supply must be imported.

About 38 per cent of the tin consumed in the United States goes into the manufacture of tin plate. Nearly 90 per cent of the American consumption goes into the four main channels: Tin and terne plate, solder, babbitt, and brasses and bronzes. In addition to the heavy consumption of primary tin, the United States recovers and consumes annually about 28,000 gross tons of secondary tin. The automobile industry consumes an average of 7½ lb. of tin per car produced. Every year the United States consumes more tin than the total amount imported, plus that which is recovered from secondary sources. The difference between this figure and the consumption is accounted for by drafts on stock or by the remelting of articles containing tin.

The Amsterdam Bank, in a report to the Government Mining Service of the Dutch East Indies, stated that there is no justification for estimating the world's annual tin production at higher figures than 145,000 to 148,000 tons. Qualified experts have asserted that any future decrease in price must come about through a decrease in consumption rather than an increase in production. The more pessimistic believe that the sources for further supply are limited, and that the present rate of consumption is rapidly bringing about the exhaustion of the world's tin resources. These predictions, however, are based upon present knowledge of the technique of mining. Many countries of the world contain millions of tons of low-grade tin ore which so far has no commercial value. Sooner or later, developments in our technical knowledge will make it workable. At the present time it appears that consumption may shortly equal or exceed production, but new technical methods, utilization of low-grade ores, and better mining methods will make available greater supplies of this semi-precious metal.—C. L. Mantell, *Iron Age,* Sept. 1.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Increased Output—and Machinery

WHILE industry is deservedly congratulating itself on the wonderful strides that have been made in production during the past decade, it is well to remember that these improvements did not come out of a clear sky. They are the result of long and careful study on the part of the designers and builders who made possible the improved machines and methods now used.

Without in any way overlooking the advantages due to skilled operators, the primary cause of the increased production is the ever-increasing number of improved machines designed to produce more and better work in a given time. The need of exhaustive human effort has been lessened, brain being utilized to direct mechanisms that replace the need of braun.

The truth of this assertion is borne out by the figures relating to metal working tools alone. In the past 13 years, over 6,500 metal working machines and tools have appeared on the market—embodying improvements on old types, developments, and new principles—all of them designed to increase output and accuracy, and to reduce upkeep and labor.

A glance at the eleven industries mentioned in the report of the U. S. Bureau of Labor Statistics bears out the claim as to machine improvement. The industries that show the greatest improvement in output per man-hour are those in which the value of newer and better machinery and methods has been most clearly recognized. Automotive industries naturally lead the list, with increases of from 172 to 211 per cent over 1914, while other industries range from 6 to 83 per cent, with the average increase around 40 per cent.

Could there be a more striking example of the value of improved machinery and methods in industry?

Where Industry Centers

WHILE the center of industry bears no direct relation to the center of population the tendency of industry is to follow the shift of populations in a general way. Considering the amount of power used in manufacturing and public utility plants as indicating industrial concentration, the center of industry in the United States was, according to statistics of the Department of the Interior, 50 miles southeast of Chicago last year. This is a shift of 25 miles westward since 1918, and nearly 75 miles since 1908. The growth of industry in the eighteen years has been 140 per cent. The center of population is 170 miles south of the industrial center, with the geographical center 640 miles away, near the center of the northern boundary of Kansas.

This trend westward has been evident for many years, in industries of various kinds. Raw material industries are apt to remain where nature has left her deposits of ore or coal, or forests. Water power no longer plays the part it did in the location of industry as high tension lines now carry it miles away with comparatively small losses.

While it is hard to say just what influences location most, it is evident that population and access to natural resources play an important part. But we must not overlook the effect that initiative, financial support and sound business policies have on every successful enterprise.

The Man Behind the Machine

IN COMMENTING on the recent British army maneuvers of the "mechanized" troops an editorial writer of the *New York Herald Tribune* puts his finger on a vital spot that is usually ignored by those who are alarmed by the machine age. He says, very wisely, that no machine is of any use, good or bad, when it stops going, and that a mechanized army will be entirely dependent on the skill of its personnel in keeping the various pieces of equipment functioning.

What was said about mechanical military equipment applies with equal force to the peaceful machines of industry. It is natural, probably, to overlook the man in control when we see a shop crane come rolling along its runway with a big casting or a locomotive suspended from its hooks. The cab is relatively small and the man in it smaller still. But without him the crane would be so much steel and copper, inanimate and only potentially useful.

The machine that can repair itself without human aid when something goes wrong has yet to be built. Until then we can discount the fears of those who dread machine domination and continue to admire those who multiply their individual power and dexterity by means of machinery.

Shop Equipment News

Bullard Automatic Vertical Turret Lathe

"INTEGRATED PRODUCTION" is the keynote of the automatic vertical turret lathe being placed on the market by the Bullard Machine Tool Co., Bridgeport, Conn., and illustrated in Fig. 1. It presents a radical change in design, with single spindle and a monitor type of turret, each tool head being capable of performing a group of operations simultaneously. The 20-in. size offered has four faces on the turret, one for the chucking position and the other three carrying the working tool heads, which perform the groups of operations progressively up to the finished piece. Each head is provided with independent changes of feed and speed to suit each group. Once the machine has been set, the complete cycle is automatic, relieving the operator of attention to control, and permitting supervision of as many machines as the cycle time allows for chucking. The machine is designed for the field of larger turret lathe work, and the ease of set-up and quick change-over make it adaptable for smaller quantities than are justified on the ordinary special-purpose machine. It is intended, however, for large quantities of repetitive jobs that will justify block-type tooling.

The bed and column casting of the machine is of rigid design and supports all operating units, maintaining alignment and making the whole machine self-contained. The base of the machine contains reservoirs for cutting compound and lubricating oil with pumps driven at constant speed for circulating the compound and oil through the system.

The work spindle, which is of the typical Bullard design, has two large cylindrical bearings and a conical seat bearing. At the head of the spindle is mounted a mechanically-operated power chuck of the three-jaw, universal type. The chuck operation is actuated from a unit in the base of the machine, which is controlled by a chuck lever. The chucking pressure may be calibrated to suit exactly the nature of the work being held. The chuck-operating mechanism may also be used to actuate special work holding fixtures. The work capacity of the machine is 20 in. in diam. and 7 in. in height. It will swing 24 in. in diam. up to 7 in. above the face of the chuck, 21 in. in diam. between the way guards, or 16 in. in diam. up to 15 in. above the chuck face. The diameter of the spindle head and power chuck body is 18¾ inches.

On the plain face of the turret column an opening is provided for accessibility to gears and shafts inside. This face is presented to the spindle during the chucking operation. and it may also be used for mounting locating devices for use in chucking. At the end of the cycle, the machine stops automatically with the plain turret face again presented to the work spindle. The tool heads, mounted on the three working faces of the turret, may be of plain, compound, universal or double purpose type, providing for vertical, horizontal, angular or a combination of vertical and horizontal feeds.

As the turret registers each tool head in the working position, the feed mechanism is tripped. The tool head then rapidly advances to the work, is locked in position, and the tool slide feeds the cut through at the predetermined rate set for that head. The tools are rapidly returned through the same path to the retired position, and the turret is indexed to the next working face. The spindle speed and tool feed obtained at each head may be varied independently according to the requirements of the operation performed. The complete cycle is automatic, it being necessary for the attendant only to place the work in the chuck and to trip the operating mechanism. In Fig. 2 are shown the heads tooled for a complete production job. The feed working unit which operates the spindle speed and the tool feed at each head is located in the base of the machine and is quickly accessible through an opening at the side. Independent sets of quick change gears provide ranges in spindle speed in three series having nineteen changes in each, the first series ranging from 7.4 to 57.5 r.p.m., the second from 11 to 86 r.p.m. and the third from 18 to 140 r.p.m. Feed gear changes also run in three series of nineteen changes each from 0.0041 in. per revolution to 0.0322 in. per revolution, from 0.0061 in. per revolution to 0.0473 in. per revo-

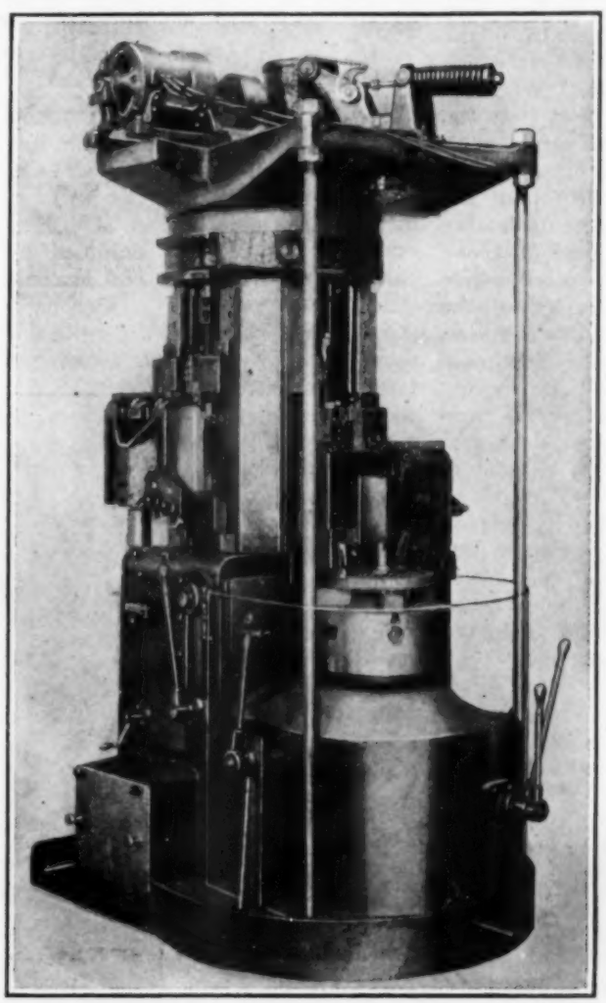


Fig. 1—Bullard Automatic Vertical Turret Lathe

Shop Equipment News

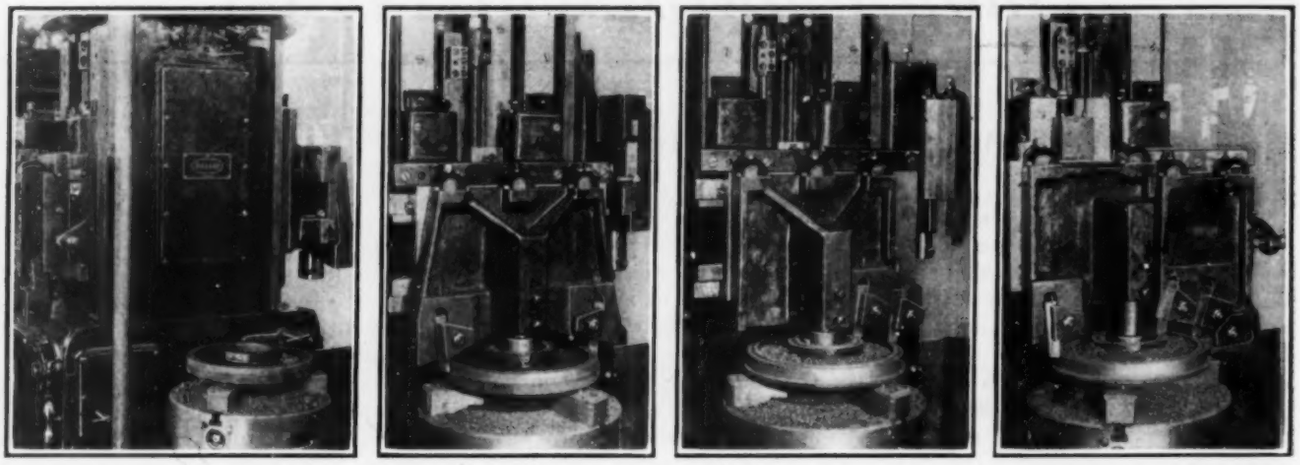


Fig. 2—Loading position and tooling at the three working positions on a typical production job

lution, and from 0.0169 to 0.1315 in. per revolution.

The feed cam provides a primary tool head traverse of 8⅛ in., which can be used vertically for rapid advance of the head to the point of cutting and for feeding through the cut. The maximum cross feed available in the compound type of head is 4 in., which leaves 4⅛ in. of vertical traverse to advance and retire the head from the work. The full vertical stroke with head in low position brings the tool slide within 8 in. of the top of the chuck, and provision is made for 8 in. of adjustment in position above this. In the highest position the slide retires 24 in. above the top of the chuck. With the universal and double-purpose head, the maximum cross slide traverse is 3 in., leaving 5⅛ in. of the primary vertical traverse for the rapid advance and retiring of the heads in relation to the work. The rate and length of cross feed for the double purpose are in direct ratio to the primary feed motion, or may be adjustably set to six lesser ratios with a minimum of 1½ in. of cross feed to 3 in. of primary vertical motion.

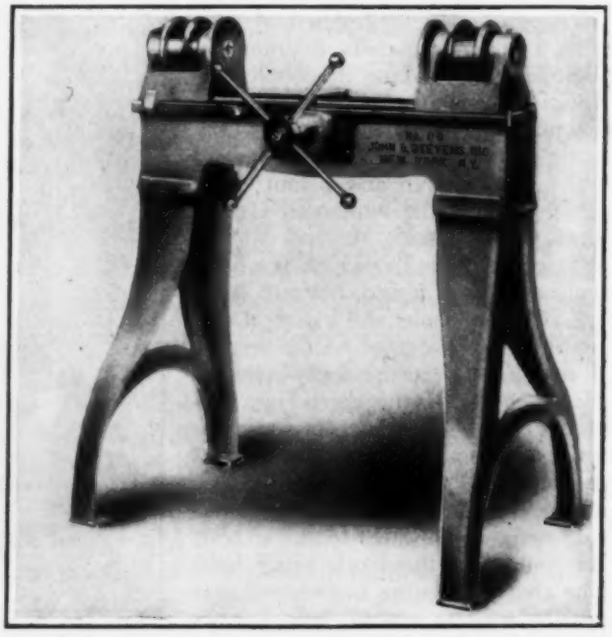
Safety features have been incorporated to protect the mechanical units from injury due to carelessness or sudden heavy loads, and there are no moving parts exposed by which the operator may be injured. Lubrication for the operating mechanism is by a flood gravity feed from the distributing reservoir at the head of the machine. External units, such as tool slides, are arranged for lubrication by the Alemite Zerk pressure oil system. The machine is designed for heavy duty throughout, special heat-treated alloy steel being used for gears and shafts subject to wear.

The drive for the machine is by a 7½-hp., constant-speed motor operating at approximately 1,800 r.p.m., and provision is made to accommodate any of the standard makes of motors. The machine requires a floor space 72 in. deep by 56 in. wide, and stands 122 in. high overall. The weight of the machine is approximately 14,000 pounds.

Stevens No. 00 Duple Horizontal Drill

TO MEET the demand for a horizontally-opposed spindle machine for reaming, chamfering, beveling, counter-boring or drilling, the No. 00 Duple horizontal drilling machine was recently designed by John B. Stevens, Inc., 27 Cleveland Place, New York, N. Y. Two high-speed spindle heads are movably mounted upon the ways which are large Vs extending the entire length of the bed top. The bed is deep and amply cross-ribbed, and rests on substantial floor legs. A pan, pump and fixture table can be supplied extra. The heads are held to the bed with adjustable taper gibs interposed to take up any wear. A centrally-located pilot wheel moves both heads simultaneously toward each other. It is mounted at the front end of a ball bearing pinion shaft carrying two pinions, one meshing direct with a rack connected with one head, the other meshing with a rack through an intermediate pinion to obtain reversal of direction of the other head. This rack feed is said to be desirable since it permits a fast feed for modern high speed drills, and a fast return of the heads. The pilot wheel has long spokes for ease in manipulation.

The spindles revolve in large ball



Stevens No. 00 Duple Horizontal Drill

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bearings, designed to carry both radial and thrust loads. They are properly protected from dust and dirt. Either a knockout rod or standard drift key can be used for ejecting the chuck or drill shanks. The front faces of the heads are machined smooth to permit the attaching of multiple spindle drill heads, and die- or tapper-head bodies.

The machine can be furnished plain, as illustrated, or in the following forms: Hand feed with integral motor drive; countershaft drive with both hand and power feed; power feed with motor drive; cam feed; cam feed with motor drive; and a machine with a bed of 48 in. instead of the standard length of 36 in. The unit weighs 450 lb., crated.

Geist 4- and 6-Inch Heavy-Duty Pipe Cutters

THE Geist Manufacturing Co., Waynesboro, Pa., has added to its line, two high-production, heavy-duty roller pipe cutters in 4 in. and 6-in. sizes. The Landis Machine Co., Waynesboro, Pa., is the sole agent for the sale of these machines. The No. 4 machine has a range from 1½ to 4 in., but, by adding a small cage of rollers it can be used for cutting off pipe from ½ to 4 in., nominal size. The standard range of the No. 6 machine is from 3½ to 6 in. inclusive. By the addition of a small cage of rollers this machine will cut off pipe from 1 to 6 in., nominal size.

The cutter is made from tool steel, heat-treated to give the maximum wearing qualities. It can be reground when dull. The cutter shaft bearing is provided with an adjustable cap on the cutter side for taking up any wear that may occur. The cutter is lowered to the pipe by means of a handwheel located at the top of the machine.

The rollers are made from tempered tool steel and are carried in roller bearings, while the cage that supports the rollers is bolted to the bed of the machine.

The length gage is adjustable for the different sizes and lengths of pipe. It will gage lengths of pipe up to and including 40 in. Parts coming in contact with the revolving pipe are hardened to resist wear. The gage-arm is a heavy forging to resist flexure.

The machine is powerful in construction and rigid in design. All spindles and shafts are ground and run in bronze-bushed bearings. The gears are inclosed, but are accessible at all times.

In Fig. 1 the belt-driven machine is shown, while Fig. 2 shows the machine equipped with motor drive. A 3-hp. motor is required for the No. 4 machine while a 5-hp. motor is required for the No. 6. When motor driven, the power is transmitted from the motor to the machine by means of gears.

Atlantic Tool Post Grinder

The Atlantic Machine & Tool Co., 28 Canfield St., Orange, N. J., is placing on the market a universal tool-post grinder. This machine is made with considerable rigidity as regards frame, spindle and bearings. It is so constructed that it may be used with equal facility for internal, external and surface grinding. For surface grinding a cup wheel is used, and for this class of work no spindle extension is necessary, making for rigidity. For external grinding the wheel is also mounted directly on the spindle, while for internal grinding the machine is furnished

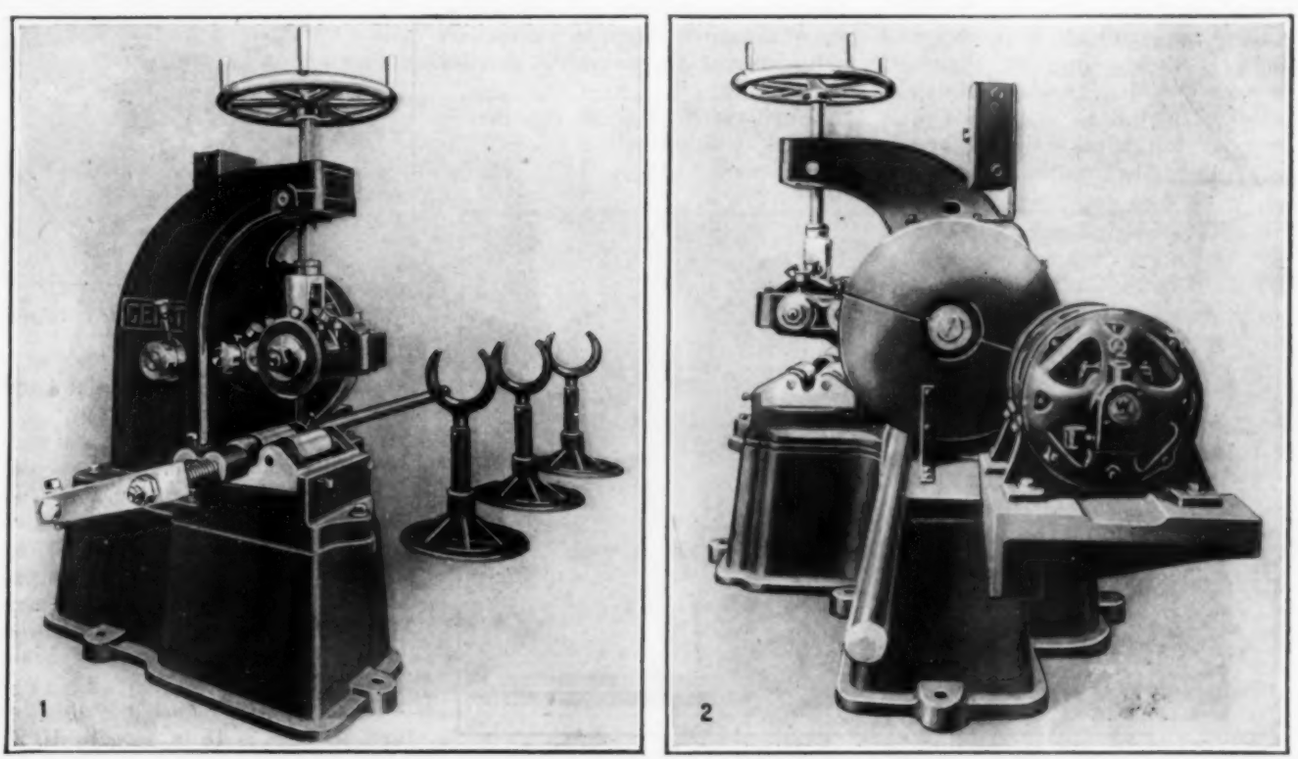

Fig. 1—Geist Heavy-Duty Pipe Cutter, Belt-Driven Model. Fig. 2—Motor-Driven Model

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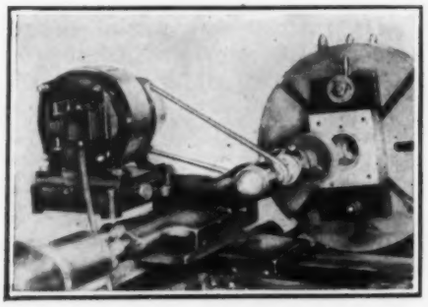


Atlantic Tool Post Grinder

with two extension spindles. The capacity for internal grinding is for holes from $\frac{5}{8}$ in. in diam. up.

The spindle is large, tapering from 1-in. down to $\frac{3}{4}$ in. in diameter. It is made of hardened, ground and lapped steel. The front bearing is a double taper, and the rear bearing is of phosphor bronze, split for adjustment. A ball thrust bearing is employed at the rear with two hardened check nuts for adjustment of end thrust and is securely covered by a dust cap. A two-step pulley is mounted between the two bearings.

The spindle is driven by a General Electric constant-speed $\frac{1}{4}$-hp. motor operating on either a.c. or d.c., at either 3,500 or 5,500 r.p.m. The motor is mounted on a dovetailed slide for adjustment of belt tension due to stretch.

The Atlantic grinder is adaptable to all lathes from 12-in. swing and upward. For surface grinding of larger pieces, it can be mounted in a shaper or planer. It is sold in an oak box with extra spindles, wrenches and wheels.

Baker Tin-Plate Electric Truck

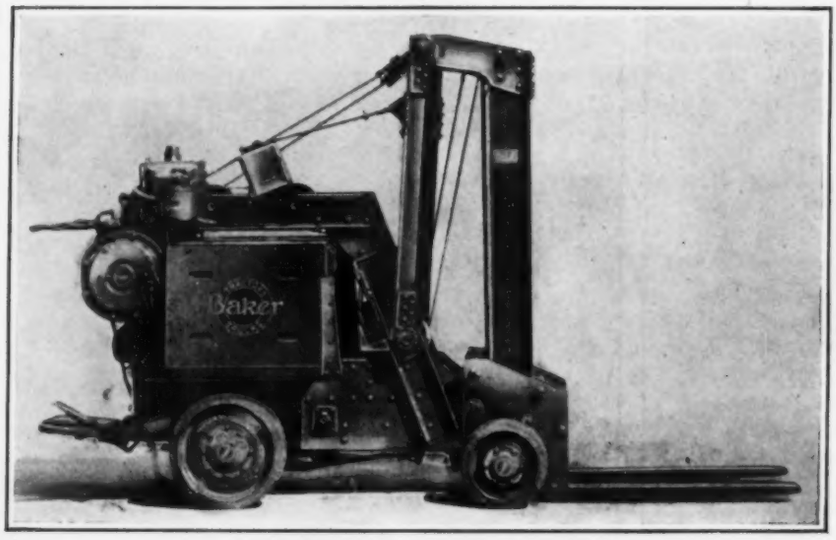
THE accompanying illustration shows a type of tin-plate truck recently put on the market by the Baker-Raulang Co., Cleveland, Ohio. This truck has a capacity of 5,000 lb. of sheets, yet is compact enough to be driven inside the average box car.

The driving axle is of the full-floating type with a 17½-to-1 worm gear reduction. The Baker series-type driving motor is mounted on a cradle cast integral with the axle housing, thereby insuring alignment between the motor, worm, and worm-wheel. In order to provide easy steering, the knuckle pivots are in line with the tire centers. The trailing axle is machined from forged alloy steel and the wheels turn on individual knuckles with the pivots also in line with the tire centers.

The controller is the standard Baker-metal type with renewable finger tips. An automatic switch of the quick-break type with auxiliary carbon contacts is provided as a safety feature. It is interlocked with the controller and prevents the operation of the truck except by a conscious and sustained action on the part of the operator.

The hoist consists of two drums either of which may be driven by a series-wound motor. A selector switch operates a set of magnetic clutches and determines which drum will be driven when the power is applied. One cable hoists the carriage and forks while the other tilts the superstructure. When picking up a load, the superstructure is normally vertical and the forks will lift high enough to stack loads one upon the other. The superstructure may be tilted a little forward of the vertical position, however, in order to bring the points of the fork prongs into contact with the floor.

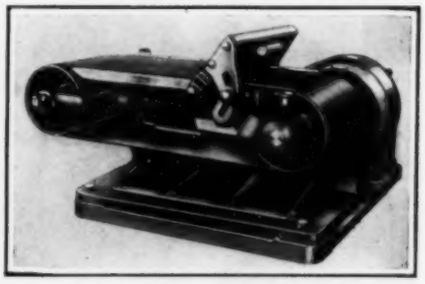
Limit switches are provided to open the hoist motor circuit at both limits of travel of the carriage and of the super structure.



Baker Tin-Plate Electric Truck

Walls Simplex B-M Abrasive-Band Grinder

To meet requirements of avoidance or lack of overhead transmissions, the Walls Sales Corporation, 96 Warren St., New York, N. Y., has placed on the market the Simplex B-M, motor-driven, abrasive-band grinder. The objective of the machine is straight-grain grinding with a rough, smooth or fine finish according to the grit of the abrasive band used. The variety of finishes possible and highly productive output make the machine desirable for the finishing of metal, composition, and wood parts.



Walls Simplex B-M Abrasive-Band Grinder

This grinder (or sander, as it is sometimes called) has the regular quick-change band feature found in Simplex machines. The abrasive band can be quickly changed by pulling out a lever, thus drawing in one pulley and releasing the band. The abrasive band always lays flat on the table after the lever is again released.

The table over which the abrasive band operates is 18 in. long by 10 in. wide and $\frac{3}{4}$ in. thick. Special fixtures

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may be fastened on it and it is planed true to produce level surfaces on the finished product. An 8 in. wide by 61 in. long abrasive band is used which may be brought to any fixed position by adjusting two thumb screws on the rear of the machine. The bevel attachment can be removed.

A 1-hp. motor furnishes the power to operate the grinder and is connected to the machine by means of a direct internal gear drive. The unit is mounted on a rigid cast-iron base.

The speed of the grinder is 875 r.p.m. The weight is 426 lb. and the bench space required is 28x31 inches.

Gleason 10-Inch Manufacturing Spiral Bevel Gear Generator

SPIRAL bevel gears up to 10-in. pitch diameter can now be cut on a production basis with this machine made by the Gleason Works, Rochester, N. Y. It has been designed as a single-purpose machine with as simple construction as possible.

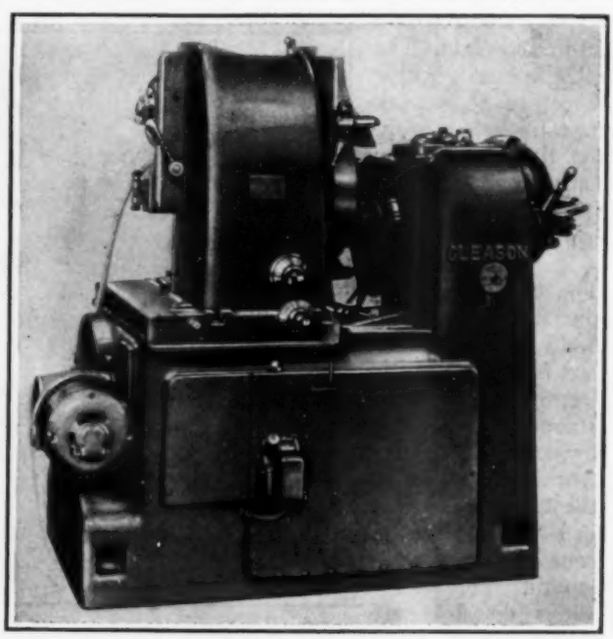
The design is a radical departure from the previous spiral bevel gear generators, but the same basic principle of generating is used as in previous Gleason machines. The generating motion is obtained by means of a crown gear and segment. Owing to the few parts involved, it is simple in operation and consequently exceedingly accurate.

The unit carrying the cutter is mounted on an upright and, to clear the cutter while the blank is indexing, it is given a lateral movement. Because of this, the gib adjustments are simple and easy to take up. The spindle carrying the cutter is mounted on ball bearings. This is a feature peculiar to this machine. Another important feature of this machine is the elimination of many moving parts by the use of three motors, one for the cutter drive, another for producing the feed and generating motion, and the third for the index. An automatic controller and push-button control station with start, stop and jog positions are required for the first two motors, while the index motor is directly connected and runs continually. The index is of the well-known worm-and-wheel type, which has proven very accurate and permits the use of change gears where it is required to index for different numbers of teeth.

By means of an automatic stop the motors for the cutter, feed, and generating motions are stopped when the gear has been completely cut, so that one operator can handle several machines.

With the exception of a few accessible hand oilers of a nature that require infrequent attention, the machine is automatically lubricated. The lubricating oil passes through a filter insuring its purity, and the operator is able to check the quantity by two oil sights. This is an important feature, as the advantages of proper lubrication are obvious.

The chips drop into a basket which is tipped into another basket when full. The second basket can then be removed from the rear when the machine is in operation without interfering with production. The cutting oil and lubricating oil are also replenished from the rear.



Gleason 10-Inch Manufacturing Spiral Bevel Gear Generator

This machine is quite compact, occupying a space of 5 ft., 7 in. by 3 ft., 10 in., and can be arranged in battery formation by using spacers to join the units together. The surfaces adjacent to the spacers are planned parallel resulting in true and tight joints. It is possible to make a change in set-up on one machine in a battery when they are in operation.

The machine is designed so that one of two work-carrying heads may be supplied: One of them is for gears of greater pitch angles than 63 deg. 26 min. and the other is for pinions of pitch angles less than 26 deg. 34 minutes. Standard equipment includes a segment for one gear or one pinion only, but a variety of gears or pinions can be arranged for at the time of building provided such gears or pinions come within the range of the workhead selected. Cutters and work arbors are supplied as extra equipment. The three motors are furnished, as well as the controller for them. The machine cannot be arranged for belt drive.

High-Speed Attachment for Brown & Sharpe No. 2 Surface Grinder

Recently, important improvements were made by the Brown & Sharpe Manufacturing Co., Providence, R. I., on the high-speed surface grinding attachment for use on its No. 2 surface grinding machine. This attachment is a mechanism for driving small grinding wheels ($\frac{1}{8}$ to $1\frac{1}{4}$ in. in diam.) at a high rate of speed and is readily and quickly applied to the machine. Slots and similar small surfaces, the location of which does not permit the use of a wheel of large diameter, can be readily ground with the attachment.

In applying the attachment to the machine, the wheel guard is removed and the attachment arm securely clamped in position on the wheel head. This arm, extending upward, carries an adjustable bracket in which is mounted a countershaft. The grinding head is mounted on the main portion of the attachment arm with its spindle parallel to the spindle

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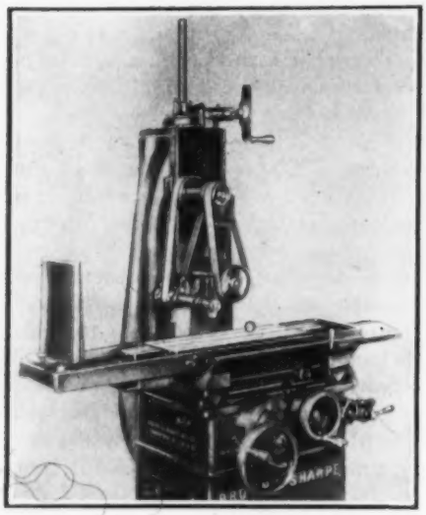


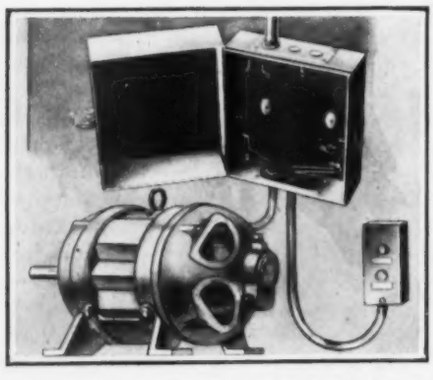
High-Speed Attachment for Brown & Sharpe No. 2 Surface Grinder

of the machine. Both the grinding head and the countershaft bracket are adjustable for belt stretch.

The drive is by a canvas belt from a pulley mounted on the spindle of the machine in place of the regular grinding wheel, to a pulley on the outer end of the countershaft. A second canvas belt transmits the drive from a larger pulley, mounted on the opposite end of the countershaft, to the grinding head. Grinding heads of different capacities and spindle speeds are available.

Westinghouse "Linestart" Motor with "Linestarter"

A "linestart" motor operated by a push button "linestarter" has been recently developed by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. The low current characteristic of the linestart motor allows starting directly from the line. This motor is provided either with a starting torque that compares with standard squirrel-cage motors or with a starting torque of two to two and one-half times full-load torque. The latter high-torque motor is recommended for driving such machines as compressors, plunger pumps, conveyors and the like where a heavy load is to be started from rest. A manual starter may be used with this motor, but the linestarter is said to be simpler.



Westinghouse "Linestart" Motor with "Linestarter"

The starter consists of a simple three-pole magnetic contactor and thermal overload relay mounted in a cabinet and operated from a push button or a master switch. The thermal overload relay protects the motor against overheating.

Sealed sleeve bearings, double impregnated windings which add to the life of the motor, forged steel feet, positive ventilation, rigid brackets and many other features of the standard squirrel-cage line are retained in this new linestart motor.

Bridgeport Type 94 Heavy-Duty Face Grinder

MANY improved features to facilitate easy and fast operation are incorporated in Type 94 heavy-duty face grinder, Fig. 2, made by the Bridgeport Safety Emery Wheel Co., Bridgeport, Conn. The chief feature is the wide range of table speeds made available by a hydraulic drive indicated in Fig. 1. Other features are the spindle mounting, the convenient spindle brake, the completeness of the feed arrangements, the treadle for controlling the carriage reversal and similar features. Special attention has been given to rigidity in order that extremely heavy loads encountered in this class of grinding may be properly handled.

The machine handles work up to 86 in. in length and 33 in. in height. The table has a working length of 86 in., but its total length without the sheet iron pans is 12 ft., 8 in. It is 32 in. wide and has six T-slots for holding the work. The distance from the floor to top of table is 34-in. The bed is 13 ft. 8 in. in length, and the total amount of possible overhang of the working length of the table beyond the bed rails is 5 per cent of the working length. The table slides on flat self-oiling ways, 5 in. wide and 22 in. apart. On the back extension the spread of ways is 38 in. and the length of ways 50 inches.

The spindle is mounted upon positively-lubricated ball bearings, incorporating an automatic take-up for end play. The shaft is of generous size, the front bearing being 6¼ and the rear bearing 5½ in. in diameter. The front box contains one extra-heavy combination thrust and radial bearing and one purely radial bearing, while the rear box contains one heavy-duty combination thrust and radial bearing and one purely radial bearing, together with the adjustable take-up mechanism. The spindle rotates at 400 r.p.m. and is equipped with a renewable quick-acting brake.

The grinding wheel furnished is

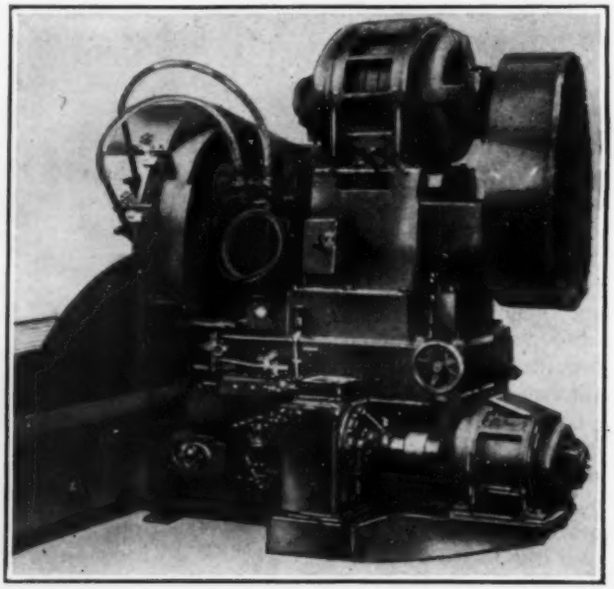


Fig. 1—Rear view of the Bridgeport Type 94 Heavy-Duty Face Grinder showing hydraulic mechanism

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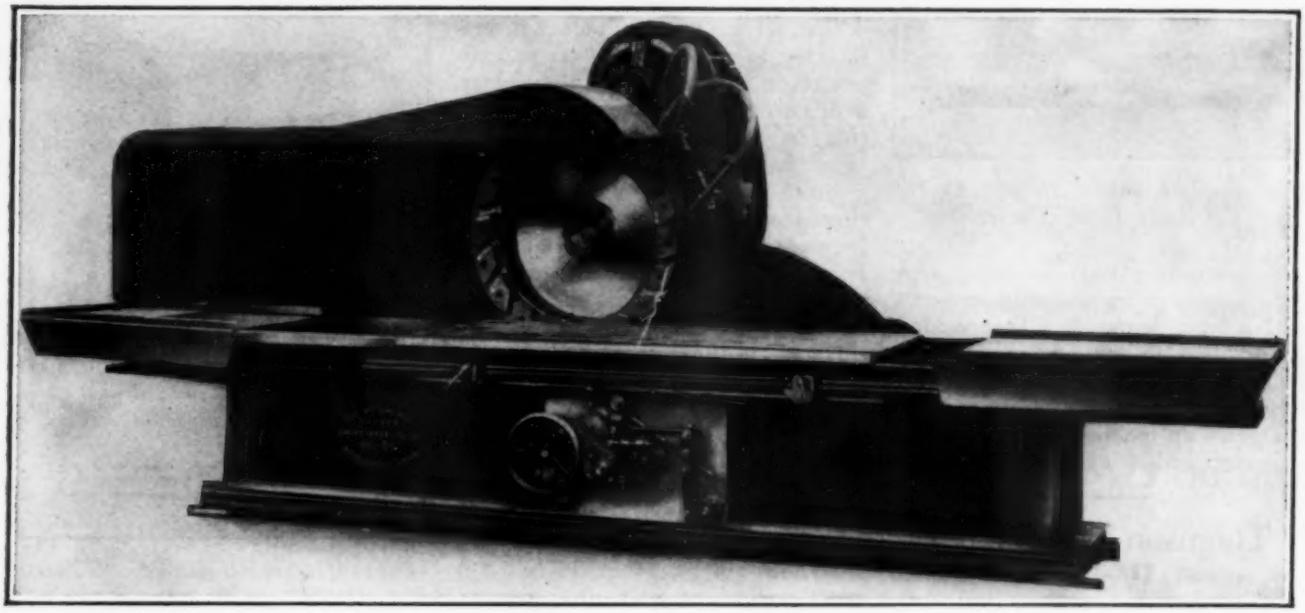

Fig. 2—Front view of Bridgeport Type 94 Heavy-Duty Face Grinder

a Bridgeport sectional wheel 42 in. in diameter, having eighteen sections of 4-in. face and 8-in. depth. A wear allowance of 7 in. is possible before the blocks need to be renewed. They are bonded in cast-iron backplates held in a cast-steel chuck.

With the hydraulic feed of the table, any speed of travel ranging from 0 to 85 ft. per minute is available. The automatic feed of the wheel head is also accomplished hydraulically, the speeds ranging from 0.00025 to 0.010 in. The feed is positive and adjustable to quarter-thousandths, and the amount is indicated on a dial. The hand feed of the wheel up to position is also indicated upon a dial. Complete control of the machine is grouped about the operator's position.

High-pressure lubrication is used wherever necessary. The driving gears are splash lubricated and the feed screw is immersed in oil. The coolant is pumped from a two-stage settling supply tank having a capacity of 160 gal. to the wheels through two 1-in. pipes having fully-adjustable nozzles. A flushing nozzle is also supplied.

The drive to the machine is by motor through a 10-in. Link-Belt silent chain completely inclosed in an oil bath. Either a 60- or 75-hp. a.c. motor or a 60-hp. d.c. motor may be used, either type having a speed range from 700 to 900 r.p.m. The carriage driving motor is rated 7½ hp. with the same speed, while the pump motor is rated at 1 hp. at 1,200 r.p.m. The machine occupies a floor space of 27 ft., 10 in. by 19 ft., 6 in. and weighs 23,000 lb., approximately.

Williams "Obstruction Superrench"

For particular use in manipulating awkwardly-placed nuts and bolts, the "Obstruction Superrench" has been introduced by the J. H. Williams Co., Buffalo, N. Y. With this purpose in view, it was designed with narrow, pointed jaws and thin heads with a 75-deg. angle of opening.

The jaws of both heads project from the same side of the handle and thus offer a comfortable grip. Also, because of this construction, the jaw that receives the strain near its point is reinforced by the handle. The wrench is forged from chrome-molybdenum steel and is guaranteed against breakage. It is furnished in a wide variety of sizes for both U. S. and S.A.E. nuts and capscrews.

Fellows No. 7A High-Speed Gear Shaper with 2-Inch Stroke

The Fellows Gear Shaper Co., Springfield, Vt., has recently placed on the market a high-speed gear shaper having a 2-in. stroke and designed for cutting gears up to and including $\frac{5}{7}$ diametral pitch. In Fig. 1 the complete machine is shown.

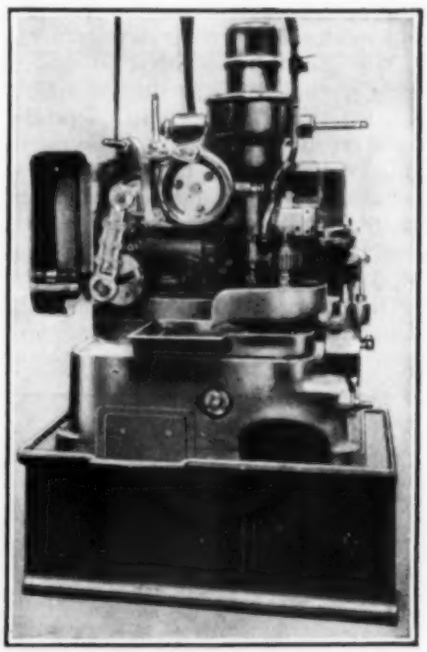

Fig. 1—Fellows No. 7A High-Speed Gear Shaper with 2-Inch Stroke

This machine has a hollow-type cutter-spindle, Fig. 2, made in one piece, which is well supported in the saddle and is arranged to carry 4-in. pitch diameter cutters only, having a 1¼-in. hole.

The entire driving mechanism of the machine has been strengthened. The driving pulleys are 15 instead of 10 in. in diameter, and also of wider face than those used on the regular No. 7 type high-speed gear shaper.

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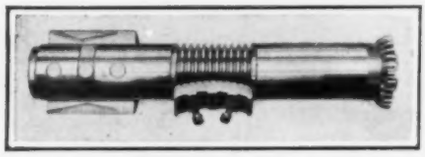


Fig. 2—The cutter spindle of the Fellows Gear Shaper

The connecting rod, operating arm, etc., have been increased in strength, and a new apron has been added. In addition to the advantages of a longer stroke, this machine is better adapted to heavy-duty work, and will cut gears up to 2-in. face, 7-in. pitch diameter and $\frac{5}{7}$ diametral pitch.

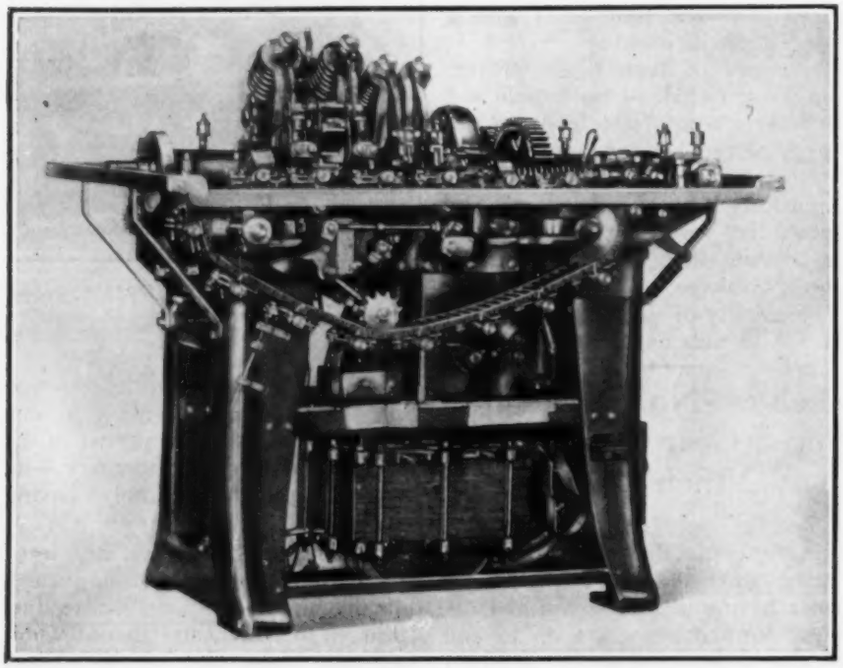
Thomson No. 28 Ring Welder

A fully-automatic machine especially designed for welding harness rings and designated as the No. 28 ring welder, is a recent development of the Thomson Electric Welding Co., Lynn, Mass. A production speed of 20 to 30 rings per min., depending upon the size of wire, is claimed. This machine makes the weld, passes the welded ring along to a striking die that flattens out the flash, and then to a trimming die that shears off the flash.

The operation is fully mechanical, including the clamping, push up, current control and burr-removing device. The operator merely inserts the ring in jigs mounted on an endless chain at the front of the welder, and the cycle is continuous. The ring is also ejected automatically. Drive is by belt and gears.

From wire $\frac{1}{4}$ to $\frac{5}{16}$ in. in diam., rings from $1\frac{1}{4}$ to $2\frac{1}{2}$ inside diam. may be made, while from wire up to $\frac{7}{16}$ in. in diam., rings from $2\frac{1}{2}$ to $4\frac{3}{4}$ in. inside diam. may be made. One set of locating fingers is required for rings in the first range and another set for rings in the larger range of diameters. The clamps are mechanically controlled through cams and springs, as is the pressure device.

The transformer has a capacity of 100 kva. and is water cooled. The machine occupies a floor space of 48x60 in. and is 54 in. high. The gross weight is 4,500 lb., approximately.

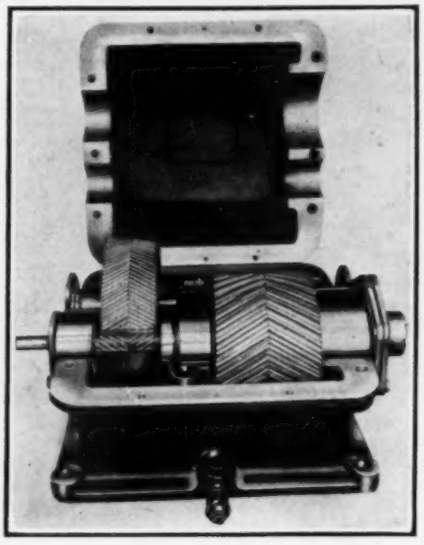


Thompson No. 28 Ring Welder

Sykes Herringbone Gear Reducer

The Link Belt Co., Chicago, Ill., has recently added to its line of power transmission equipment the Sykes herringbone reducer, one type of which is illustrated herewith.

The reducer is being made in three standard units designed to cover a wide range of ratios and capacities. Type S, a single-reduction unit, covers ratios up to 10 and 1. Type D, a double-reduction unit, is designed for heavy-duty and ratios from 10 to 1 up to 80 to 1. Type DV is a light-duty, double-reduction unit with ratios ranging from 10 to 1 up to 130 to 1, inclusive.



Sykes Herringbone Gear Reducer

The herringbone gears, made of high-carbon steel, have continuous teeth across the face of the gear. The pinions are made of heat-treated alloy steel with the teeth cut integral with the shaft. Double oversize ball bearings are used throughout to take care of thrust and overhung loads, which the unit might be subjected to in service. All bearings are splash lubricated and special oil baffles are provided at the shaft projections to prevent loss of oil. No oil grooves or oil wipers are used.

"Ammco" Rigid Cylinder Grinder

Five stones are used in the "Ammco" rigid cylinder grinder, made by the Automotive Maintenance Machinery Co., 549 W. Washington St., Chicago, Ill., so that no two stones are diametrically opposed. This construction is said to eliminate chatter, to produce more accurate work, and to eliminate stone breakage. With four sets of stone carriers, the tool handles all bores from $2\frac{3}{8}$ to $4\frac{1}{2}$ in. Each set has a range of expansion of $\frac{1}{2}$ in. in diameter.

Four grades of stones, extra-coarse, coarse, medium and fine, are supplied. These stones are cemented in steel jackets and are interchange-

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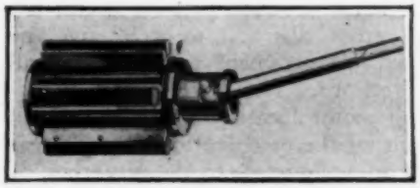


"Ammco" Rigid Cylinder Grinder

able in the different sets of stone carriers. The carriers are rigidly held in radial slots at both ends and are supported on hardened and ground cones. A circular coiled spring holds the carriers against the cones.

The tool is ruggedly constructed of hardened steel throughout, but is light and easy to handle. It can be operated by any standard $\frac{5}{8}$-in. electric drill.

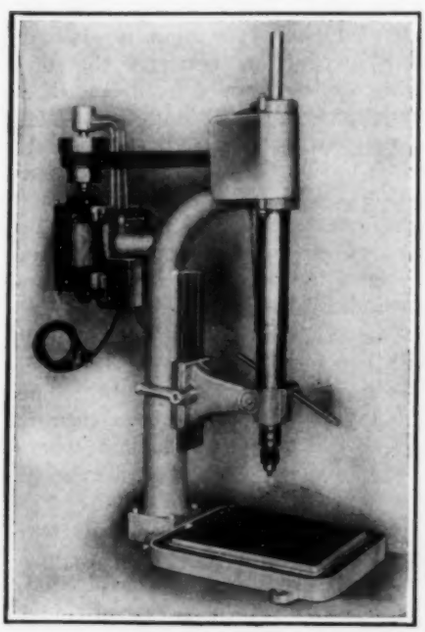
Canedy-Otto 14-In. High-Speed Sensitive Drill

This 14-in. high-speed, sliding-head sensitive drill, made by the Canedy-Otto Manufacturing Co., Chicago Heights, Ill., is designed to meet the demand for high-speed production. It will drill holes up to $\frac{5}{16}$ in. in diameter. The unit is equipped with a vertical-type motor driving direct to the spindle without the use of idlers.

The motor is attached in such a manner that it can be moved in and out and firmly clamped in position to give the desired belt tension at all times. The driven pulley is mounted on a quill carried in ball bearings with ample provision for lubrication. The sliding head and adjustable spindle stop give a wide range of drilling. The spindle sleeve is counter-balanced so as to give a sensitive and uniform action to the feed.

All moving members are amply protected to insure safety, and all machined surfaces are accurately finished. The table has an oil groove around it and is provided with a drain. The machine comes equipped with the necessary cord and toggle switch for attachment to a socket.

Spindle speeds of 3,400, 5,600 and 10,000 r.p.m. are available by means of the three-step cone pulley mounted on the motor shaft extension. The spindle has a travel $3\frac{1}{4}$ in., while the head has a vertical adjustment of $7\frac{1}{2}$ in. Maximum distance from the bottom of chuck to the table is $10\frac{1}{2}$ in., while the distance from the column to the center of the spindle is $7\frac{1}{4}$ in. The table measures $9\frac{1}{2}$x$12\frac{1}{2}$ in., and the bench space occupied by the entire unit is 15x20 in. Its total height is 41 in., and the net weight 180 pounds.



Canedy-Otto 14-Inch High-Speed Sensitive Drill

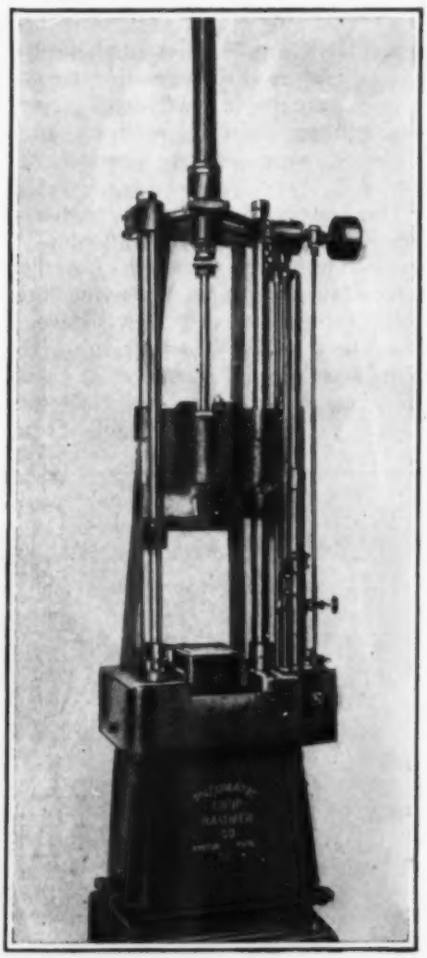
Improved Pneumatic-Lift Drop Hammer

AN IMPROVED type of air-lift, gravity drop hammer, which is a development of the hammer illustrated and described on page 179, Vol. 62, of the *American Machinist*, is being put out by the Pneumatic Drop Hammer Co., 261 Franklin St., Boston, Mass. The head of this hammer is lifted by air pressure in a cylinder mounted vertically on a tie-bar at the top of the columns in line with the travel. The blow is delivered by the falling weight of the head, unassisted by air pressure, but the force of the blow may be adjusted to any desired amount within the capacity of the machine by adjusting the control valves to give a cushioning effect. This adjustment is made by the single movement of a lever which may be moved at will by the operator to strike light and heavy blows alternately or locked in one position to repeat blows of any desired force indefinitely.

The head slides upon two round columns of steel which are ground accurately to size and parallelism. Two bronze bushings on each side of the head encircle the round columns and provide ample wearing surface to guide the falling head without undue friction, yet confine it against looseness and tendency to shake when the blow is delivered.

The head is released to strike the blow by a safety device, entirely pneumatic, which will not permit the release to occur while either of the operator's hands are in the danger zone; or it may be released by a treadle. The valves may be set to operate the head continuously while the treadle remains depressed, or to deliver one blow, only, at each depression of the treadle.

A quickly made adjustment of the safety device renders the treadle inoperative when desired so that the dies may be adjusted or removed without danger of the hammer head falling by reason of accidental depression. The valves are so con-



Improved Pneumatic-Lift Drop Hammer

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structed that the head cannot fall because of failure of the air pressure, or even because of breakage of the supply pipe.

The height of drop may be regulated to any distance within the capacity of the machine, and the valves set automatically to cushion the blow to any desired extent. The head is ordinarily held up by air that is trapped in the cylinder, but a mechanical safety dog is provided to engage and hold it up while changing or adjusting the dies.

The advantages claimed for the hammer are: that it is self-contained and can be set up anywhere without reference to belts, shafts or other power transmitting devices; that it is rapid in action because of the fact that the head is picked up instantly on the rebound by the air cylinder and there is no loss of time, or "shivering" in the return stroke; and that it so simple in construction and operation that it may be operated by unskilled men

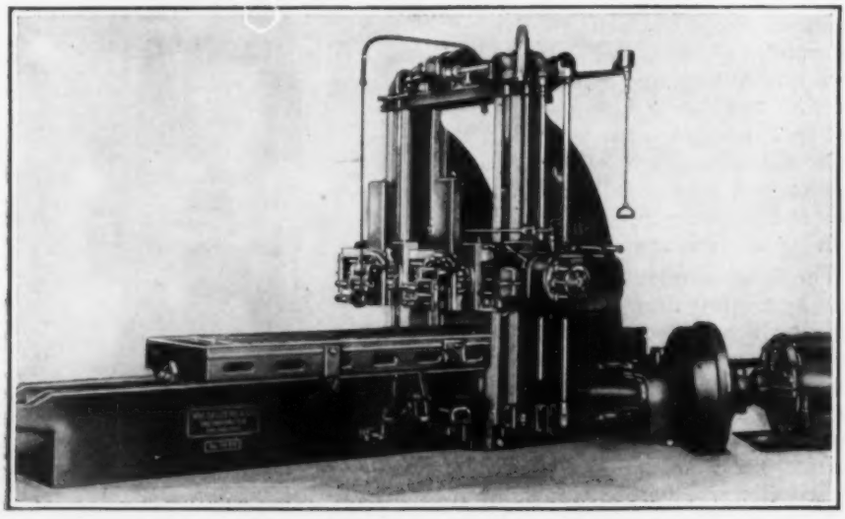
It is made in all sizes from 50 lb. up. The anvils are ordinarily made to weight fifteen times as much as the heads, but may be made in 20-to-1 ratio for special work, if desired. A steel insert in the anvil secures the lower die.

Sellers 36-Inch Type K Planer

MODERN improvements, such as power traverse, dial feed, central lubrication, and a single-lever crosshead locking device, have been made to the 36-in. Type K planer made by William Sellers & Co., Inc., Philadelphia, Pa. The whole machine is designed with simple substantial mechanisms and readily accessible parts. It is constructed to withstand heavy cuts and maintain its accuracy and efficiency over a long period of service.

The bed is of box-type construction with one flat and one double-V way. The latter consists of a flat V combined with a V having the walls inclined a very few degrees from the vertical. The bearing of the table is on the flat V except in cases of excessive side pressure when the upper V will hold the table from moving out of place. When there is no side thrust, the upper V clears by a few thousandths of an inch. The ways are furnished with an ample supply of oil from a pump driven by a separate motor. The control for this motor is so connected in the starting-motor circuit that it will always be running before the table starts. In this way lubrication is assured even after the machine has been standing idle. The pressure of the oil is constant and sufficient to force it through the grooves for the full length of the table. The oil is collected at the ends of the bed and is filtered before being returned to the tank.

With the Sellers type of drive there is only one shaft running through the bed and only one gear, a worm gear, located between the ways.



Sellers 36-Inch Type K Planer

This construction permits liberal use of cross ribs and webs to give the box reinforcement to the bed in all directions. The drive is by a reversing motor located on the right-hand side of the machine towards the rear at an acute angle to the centerline of the bed. The motor is mounted on a separate baseplate and is coupled to the worm shaft. There is one herringbone gear reduction between the motor and the main driving shaft that carries the worm. This worm engages a rack under the table and is so designed that four teeth are always in contact, and, with the angular position of its shaft, the worm does not develop any side pressure. The thrust from the worm is taken on step bearings adjustable from the outside of the bed where they are readily accessible. Oil is continually circulated through these bearings.

The table is of deep, box construction and is provided with T-slots and stop holes. It is open at the side for removal of chips. The driving rack is separate from the table and is made in sections fastened to the table by clamps. One end of the rack butts against a solid stop and the other end is held by a heavy steel clamp. This method of holding the rack is said to prevent the distortion sometimes produced by bolts or dowels placed through the rack itself.

The uprights are also of heavy box section, bolted and keyed to the side of the head. The cross rail is of the extended back type, and is also of box construction between the uprights and is clamped by means of a single lever. The clamp is so designed that it fastens the cross rail to the uprights and at the same time holds the uprights together at a point as close as possible to the work. The cross rail in this way acts as an extra crossgirt located at a minimum distance above the work.

The machine is usually equipped with two heads on the cross rail and a side head on each upright. The saddles and slides have been entirely redesigned and strengthened wherever possible. Power traverse is provided for all heads.

The design of the feed and traverse mechanism is simple and rugged. Selective levers for the various motions are conveniently located. One head can be traversed while another is feeding. The screws and shafts are provided with micrometer dials

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for setting the heads accurately. Central unit lubrication is provided, simplifying the work of the operator in oiling. The feed is accomplished by a separate motor. A dial on the cross rail and on each side head is used to set the amount of feed. Ball bearings are provided wherever possible. The mechanism is arranged so that it is not possible to put both feed and traverse on the same head at the same time.

The saddle castings are made of heavy section and provided with taper gibs. The tool slide is of the outside type. With this design the bearing between the slide and the swivel that carries it remains constant for short or long overhang. A spring compensating device takes all lost motion from the vertical screw and nut and prevents the slide from dropping at the end of the stroke. The slide heads are counterweighted.

The control equipment is of the magnetic type and is operated by push buttons or switches built into the machine.

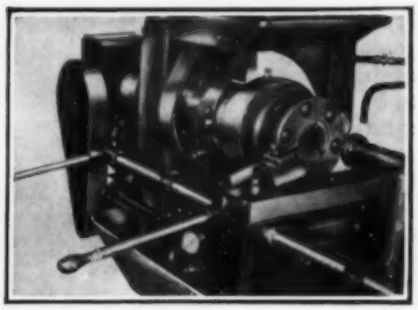

Fig. 2—Close-up view of the automatic chuck and tool slide

Bardons & Oliver 1½- and 3-Inch Cutting-Off Machines

CUTTING-OFF machines for bar stock and tubing of 1½- and 3-in. capacity, are being manufactured by Bardons & Oliver, Cleveland, Ohio. They are operated through the entire cycle by one movement of the hand lever. On average work, not more than 3 to 5 seconds are required for the opening of the chuck, feeding of the bar or tube, closing the chuck and getting the tool back into the cutting position. Hence, it is entirely practical to make 6 to 10 cuts per minute, depending upon the nature of the material and length of pieces to be cut. With simplicity of operation, durability of construction and readily adjustable changes for varying sizes of bars and length of cut, these machines are claimed to be well adapted for fast production by unskilled operators. In Fig. 1 a general view of the machine is shown.

In Fig. 2 a close-up view of the chuck and cutting-off tool is shown. An air-operated collet form of chuck is used, and the master collet is of the hinged type, said to be very durable. The false jaws for the different sizes of stock are readily changed without removing the collet from the spindle. The opening and closing of the collet is controlled by a valve located on the front of the head. This valve is operated by a short arm mounted on the same shaft that carries the hand lever controlling the cross-feed pinion. The cut-off slide is regularly equipped with a tool holder carrying a high-speed steel cutting-off blade. Multiple tool holders can also be furnished on special order.

The spindle is of large diameter and runs in Timken roller bearings. The motor is mounted on a tilting table directly over the spindle, and drives by means of a silent chain.

The roller feed is driven by a separate motor, which may be of the constant-speed type since the rolls revolve continually. After opening the collet, further movement of the lever brings the feed rolls into contact with the stock, thus almost instantly advancing the stock against the adjustable stop. By a link connection with the lever shaft, the stop is automatically withdrawn from contact with the end of the stock just before the tool starts cutting.

With either the 1½- or 3-in. capacity machine, the maximum length of stock that can be cut with the regular stop is 5 ft. The driving motor in each case is rated at 3 hp. and the feed motor at ½ hp. The approximate floor space occupied is 11x3 ft. overall for both machines, while the weights are 3,250 and 3,500 lb. respectively.

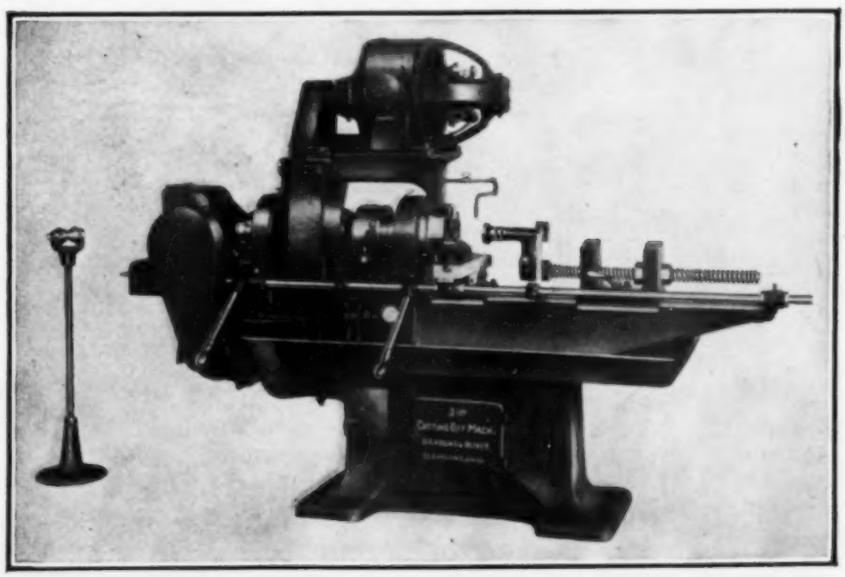

Fig. 1—Bardons & Oliver 3-Inch Capacity Cutting-Off Machine

"Fuzon" Electric Welder

To meet special conditions the "Fuzon" direct electric welder is made in a number of styles and sizes by the Fusion Welding Corporation, 103rd St. and Torrence Ave., Chicago, Ill. It may be had in either portable or stationary type, motor or gas-engine driven, or by belt from a lineshaft. Certain types embodying two generators and one motor permit one or two operators to work from the same set. The available current may range from 100 to 800 amperes.

In all the various types the same general principles are applied. The stabilizing is accomplished entirely by the generator winding, a feature cov-

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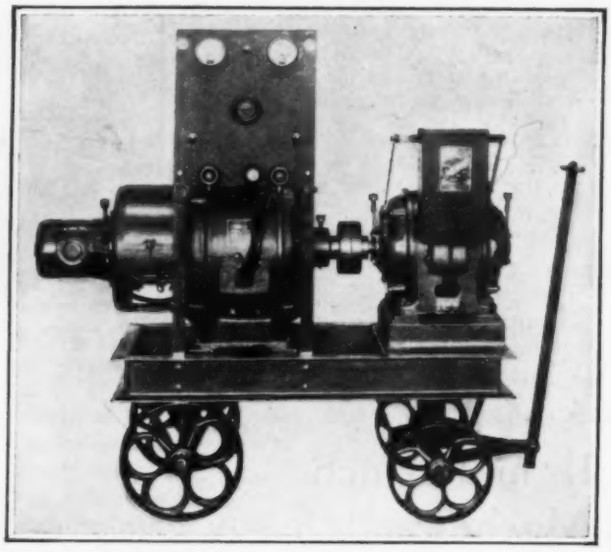
ered by the Hansen patent. This method of balancing is said to be more economical than the use of ohmic or inductive ballast resistance. All Fuzon welders are extremely compact yet all parts under strain or subject to wear are ruggedly proportioned. Ball bearings are used throughout so that frequent oiling is not required. The voltage regulation is completely automatic and covers a wide range for both carbon-arc welding and metallic rod welding.



Single-Operator Portable "Fuzon" Welder

The welder is equipped with an instrument panel containing the usual voltmeter, ammeter and rheostat for adjusting the welding current. The generator may also be adjusted for arc stability or starting current. This increases the range of the unit and allows thin sections to be welded, or excessive starting penetration required for heavy sections can be obtained.

Ransom Type HS Grinding Machines

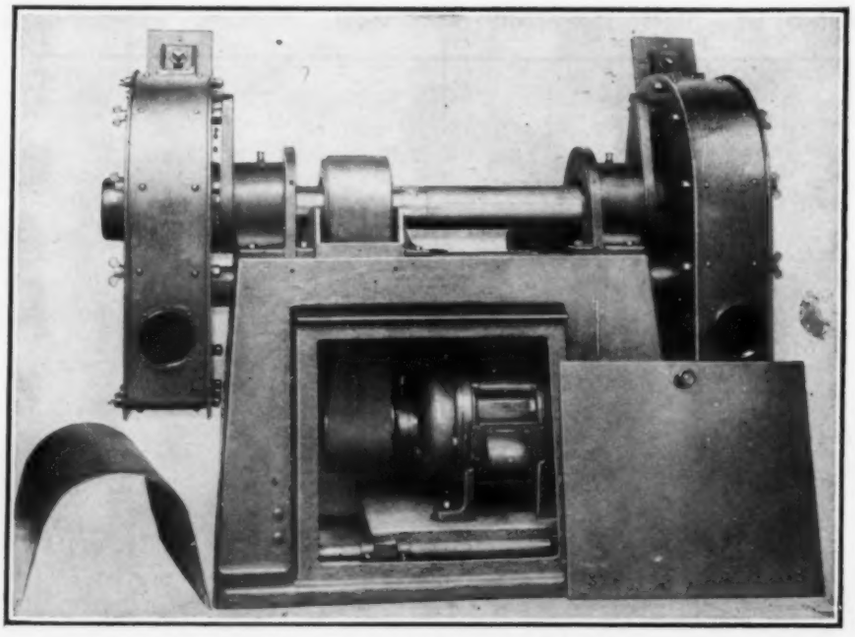
A line of grinding machines, known as Type HS, incorporating direct electric drive from a.c. motors was recently designed by the Ransom Manufacturing Co., Oshkosh, Wis. A typical machine is shown in the accompanying illustration. These machines are designed with the rigidity to operate at any wheel speed up to 11,000 ft. per min. peripheral speed. The base has a large floor area to give it stability, but the frame is so designed as to be out of the way of the workman for almost any class of work.

The spindles are large and are mounted on S.K.F. ball bearings of ample size for carrying large wheels at high speed. An oil filter is incorporated in the bearings to provide against abrasive. Wide fiber pulleys are mounted on the spindle and motor. Double-ply belts are used.

In the base, the motor is bolted to a pivoted plate, which is adjustable for tightening the belt by means of a screw. Any standard make of motor can be supplied. The desired spindle speeds are obtained by changing the pulley sizes.

A feature of the line is the adjustable and removable rests and rest brackets which permit the workman to do apron grinding. The guards have a removable hopper at the front to allow the workman to stand close to the wheel.

The No. 22 HS grinder is driven by a 7½-hp. motor and is for use with wheels 14 in. in diameter by 3 in. face. It has 10-in. flanges. The distance between wheel centers is 49 in. Net weight with motor and guards is 1,775 lb. The No. 43 HS machine is driven by a 10-hp. motor and is for use with 18x3-in. wheels. It carries 13-in. flanges, and the wheels are 49 in. between centers. Its weight is 2,600 lb. Both the Nos. 64 and 74 HS machines are driven by 15-hp. motors and measure 51 in. between wheels. They carry 21x3-in. and 24x3-in. wheels, respectively, and weigh 3,100 and 3,200 lb. each.



Ransom Type HS Grinding Machine

Johnson Jig Spacer

Any standard vertical milling or drilling machine may be converted into a jig borer through the use of the Johnson jig spacer, made by the Trundle Engineering Co., Cleveland, Ohio, and shown in the accompanying illustration. The unit may also be used on a shaper, planer, or slotter for accurate spacing work. It is compact and rigid in construction and is readily portable.

The fixture consists of a base upon which is mounted two slides that travel at a right angle to each other. Accurate control of spacing is obtained by using standard, fixed, end-measuring gages furnished with the unit and used with indicators, also a part of the equipment. Thus the accuracy does not depend upon the feed screws.

The clamps used to lock the slides in position are independent of the gibs and do not disturb the gib setting. They consist of an arrangement of levers operating in the

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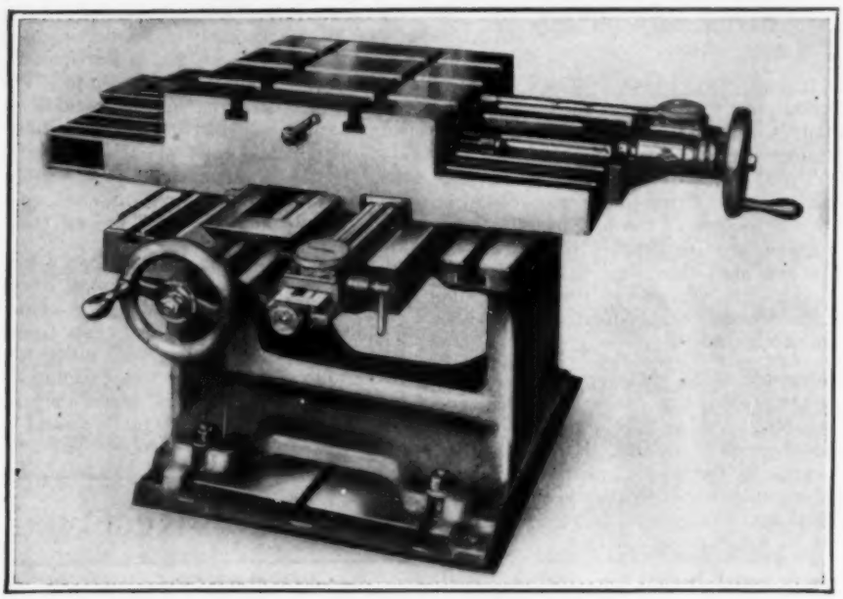


Johnson Jig Spacer

T-slots, and they clamp the flat surfaces of the slides without distortion of the setting.

The work table measures 16x16 in. and has a travel of 12 in. without overhang, and 15-in. with an overhang of 3 in. The length of the short slide is 26 in., while the length of the long slide is 32 in., providing a longitudinal travel of 15 in. The unit occupies a floor space of 37x45 in. and weighs 525 lb. net.

"Mikron" No. 79 Bench Gear Hobbing Machine

The Triplex Machine Tool Co., 50 Church St., New York, N. Y., has introduced on the American market, the Mikron No. 79 bench-type gear and pinion hobbing machine, shown in the illustrations. The machine is useful for hobbing gear wheels and pinions up to 1½ in. in diameter and up to 1½ in. in length. It is used for the hobbing of brass and steel gears of electric and water meters, clocks, watches and counting apparatus, phonographs and the like.

The capacity of the machine allows gear wheels to be cut with numbers of teeth from 6 to 500 by using change gears. All the driving gears are completely inclosed in the machine and the change wheels are accessible by removing the cover plates. The pieces to be cut are held firmly on an arbor during the cutting operation and slip of the blanks is entirely prevented. In practice, a spare arbor mandrel is utilized with the machine so that it can be filled up with gear blanks, ready to replace those being cut in the machine.

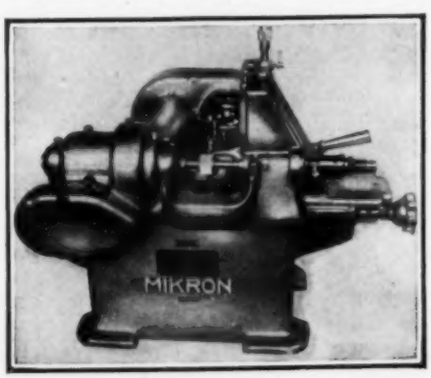


Fig. 1—"Mikron" Bench Gear Hobbing Machine

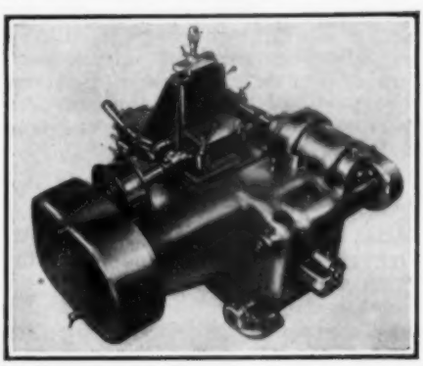


Fig. 2—Rear view of the "Mikron" Hobber

The feed of the hob can be varied according to the material to be cut, the change gears regularly furnished with the machine allowing a variation of 0.004 to 0.030 in. feed per revolution of the cutter.

The hobs used with the machine are the backed-off type, so they may be resharpened easily. The machine is provided with an aluminum oil reservoir for the cutter lubricant, and this reservoir has a filtering compartment to protect the oil pump from foreign matter.

The machine is regularly furnished with countershafts, oil pump, reservoir and wrenches. Other tools such as arbors, and draw-in spindles for spring chucks, can be furnished. The approximate net weight of the machine with countershaft is 125 lb., and the floor space occupied by the machine is about 20x22 inches.

"Wizard" Quick-Change Chuck

The "Wizard" quick-change chuck, formerly manufactured by the American Standard Tool Works, Detroit, Mich., has been added to the line of tools put out by the J. C. Glenzer Co., 6463 Epworth Blvd., Detroit. The patents, jigs, fixtures, gages and machinery have been acquired by the company.

Mitchell Threading and Tapping Machines

The Mitchell Engineering Co., Springfield, Ohio, recently purchased the complete line of threading and tapping machinery, formerly manufactured by the Webster & Perks Tool Co., of the same city. This line consists of multiple-spindle horizontal threading and special tapping machines, automatic die-type threading machines, and vertical nut-tapping machines. The present manufacturers are in a position to handle repairs and replacements for any machines furnished by its predecessors.

Trade Catalogs

ELECTROPLATING AND BUFFING APPARATUS. A. T. Munning & Co., Matawan, N. J., has published Catalog No. 10, illustrating and describing the extensive line of plating and buffing apparatus and supplies manufactured by this company. The catalog contains 276

pages and measures 7½x10½ in. Some of the materials described are grinders and polishers, polishing motors, sand-blast barrels, tumbling barrels, brushes, polishing wheels, polishing compositions, electroplating generators, plating room electrical equipment, stoneware and dipping baskets, anodes and plating salts, and chemical glassware. The catalog also contains 28 pages of useful information for the polisher and electroplater.

FLEXIBLE HOSE. Chas. Cory & Son, Inc., 183 Varick St., New York, has issued the third edition of its Hose Bulletin No. 201-29-C. The 12-page bulletin contains illustrations, data and descriptions of seamless flexible metal hose for use as a flexible conveyor of non-solids and non-abrasives. The bulletin also contains useful data in regard to flexible hose.

HEAT-TREATING. The Lebanon Steel Foundry, Lebanon, Pa., has published Bulletin 16 of a series on the subject of its electric-furnace steel castings. This particular unit deals with the heat-treatment of steel castings. A technical description is given with the aid of microphotographs.

LATHE, AUTOMATIC. The Jones & Lamson Machine Co., Springfield, Vt., recently published a book on its Fay automatic lathe. The book contains 260 6x9-in. pages profusely illustrated throughout with line cuts and halftones. It is completely indexed and bound in stiff cloth covers. The machine is completely described together with the motions of the carriage, front former, and back former, as well as the lubrication and adjustments of the machine. Complete setting up and operating instructions are given with the aid of numerous diagrams. The same treatment is applied to the tooling of the machine. One chapter is devoted to examples of work that has been done on the machine. Additional chapters describe tool design, cam design and time estimating. The treatment is technical in character.

LATHE, TURRET. The Gisholt Machine Co., Madison, Wis., has issued catalog 2L-1 on its No. 2L heavy-duty turret lathe. The construction of the machine is completely described with the aid of numerous photographs. The principal features are summarized and general specifications are given. Bar and chucking tools are illustrated, as well as the machine and its parts.

MAGNETIC CHUCKS. O. S. Walker Co., Inc., Worcester, Mass., has issued Circular S4, illustrating and describing in detail its standard line of rectangular magnetic chucks, with some reference made to other products built by the company. The circular contains eight 8½x11-in. pages, and shows a cut and the principal dimensions of each type of chuck.

MICARTA GEARS & PINIONS. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued circular 1579-E, describing Micarta gears and pinions. The bulletin contains twenty 8½x11-in. pages and besides the general description shows halftones of the gear mountings, together with diagrams and useful gear tables.

MOTORS, INDUCTION. The Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland, Ohio, has published Catalog Section A, Pages 1 to 16, on its Type AA induction motors for use with two- or three-phase a.c. circuits. The advantages of the ball bearing construction are featured. Structural details are also described. Considerable space is also devoted to starting equipment. Complete specifications and ratings are included.

MOTORS. The Master Electric Co., Dayton, Ohio, has prepared two circulars, Nos. 365 and 369, describing its line of electric motors. The particular features of the motors are pointed out and complete specifications and dimensional data are given.

NICKEL ALLOY STEEL PRODUCTS. The International Nickel Co., Inc., 67 Wall St., New York, has published an 8-page folder, giving lists of representative manufacturers producing nickel alloy steel products. The folder is arranged as a buyers' guide, and lists the manufacturers alphabetically under the name of the product manufactured.

PAINTING EQUIPMENT. The Spraco Painting Equipment Co., 60 High St., Boston, Mass., announce Bulletin No. 62-F and Bulletin No. 62-M, describing its lines of industrial finishing equipment and portable painting equipment for the contract painter. The bulletins are fully illustrated and contain specification data on each type of apparatus shown. The Industrial Bulletin 62-F describes spray guns, spray booths, fans, tanks, and special equipment.

PLUG GAGES. The Van Keuren Co., 12 Copeland St., Watertown, Boston, Mass., has issued circular P-29 on its plug gages, test plugs, and measuring cylinders. This four-page leaflet is a supplement to its catalog No. 28. The advantages of the gages are pointed out and specifications and prices are given. The leaflet is illustrated. It includes a table of 134 stock sizes of plug gages.

PYROMETERS. The Pyrometer Instrument Co., 74 Reade St., New York, N. Y., has issued Bulletin No. 20, describing its line of Pyro radiation pyrometers. The catalog has sixteen 6x9-in. pages, and is illustrated with halftones and line drawings.

TANKS AND TOWERS. W. E. Caldwell Co., Inc., Louisville, Ky., recently published the 38th annual edition of its catalog. The line made by this company includes round and rectangular wooden tanks and fittings, riveted and welded steel tanks of both rectangular and hemispherical-bottom type, as well as the steel towers to support them. The publication contains forty-eight 6x9-in. pages and is well illustrated throughout. Complete specifications and prices are given in each case.

TOOLS. The Oswego Tool Co., Oswego, N. Y., recently published catalog No. 28 on its tools for boiler-makers, machinists and pipe-workers. The publications contains forty-four 6x9-in. pages and is well illustrated throughout. The line includes pipe wrenches of various types, tube expanders, pipe cutters, machinists vises, combination vises, pipe vises, screw punches and kindred tools. The catalog is indexed.

TOOLS. The Milwaukee Tool & Forge Co., South Milwaukee, Wis., has issued a catalog on its products containing forty-four 6x9-in. pages, well illustrated throughout. The line includes wrenches, chisels, punches, reamers, screw drivers, socket wrenches, gear pullers and a complete line of track tools.

Pamphlets Received

A.E.S.C. The 1927 Year Book of the American Engineering Standards Committee, 29 West 39th Street, New York, N. Y., is now available. It contains eighty 8x10½-in. pages and is bound in flexible paper covers. The contents include a summary of the year's work, progress in industrial standardization, the purpose and organization of the committee, its methods of work, its relation to industrial associations, membership, government co-operation, and co-operation with foreign standardizing bodies. A complete list of standardization projects either completed, under way, or contemplated is given. A list of co-operating bodies is also included as well as a list of sustaining members.

DRAWING INK. Government master specification for black waterproof drawing ink is now available in circular No. 196 of the Bureau of Standards, Department of Commerce, Washington, D. C. Requirements as to permanency, consistency, drying power, color and opacity, effect of solvents and moldiness, are given as well as methods of inspection and test.

GASKETS. Master specification for asbestos metallic cloth gaskets is now available in the form of a circular No. 242 of the Bureau of Standards, Washington, D. C. Copies may be procured from the Supt. of Documents, Government Printing Office, for five cents.

FATIGUE CRACKS IN CAR AXLES. The Engineering Experiment Station of the University of Illinois, Urbana, Ill., has published Bulletin No. 165 entitled "A Study of Fatigue Cracks in Car Axles." It may be procured from the University for 15 cents. A brief discussion is first given of the fatigue failure of metals, then the method of testing car axles for fatigue cracks is described and the test data recorded. The conclusions are summarized.

NEWS OF THE WEEK

Four Thousand Horsepower Required to Drive Machine Tools Shown at Cleveland Exposition

Ten thousand visitors prove nation-wide interest in new designs

THAT 4,000 hp. was employed to drive the machine tools exhibited at the first Machine Tool Exposition, held under the auspices of the National Machine Tool Builders Association in the Cleveland Auditorium Annex, Sept. 19 to 23, gives some idea of the size of both the exhibits and the number of machines shown. Never before has such a group of machine tools been seen at any exposition. And, for the first time, the attendance was limited to those directly interested in machine tools and their operation.

Among the outstanding features of the exposition were: A new show with 65,000 sq.ft. of occupied booth area completely sold before a chart was issued, and at no expense for selling; an over subscription of 33⅓ per cent, months before the show; probably the greatest tonnage of exhibits per foot of booth area of any show ever held. Every exhibit was installed and ready for operation on time. These highly desirable results were in no small measure due to the hearty co-operation of exhibitors and those of the auditorium staff, as well as the men who handled the exhibits from the railroads to the exposition floor, this being in marked contrast to the methods encountered last year in Chicago. Perhaps no single feature of the exposition was more appreciated by the various exhibitors. The management staff, from Roberts Everett and J. M. Stewart down, were also of great assistance.

Exact attendance is always difficult to secure. Registrations, however, indicate from 8,000 to 10,000, not counting those who took advantage of the one open evening. Exhibitors agreed that at no previous exhibition had they been able to meet so many live prospects or to explain their machines so satisfactorily, and numerous sales were reported. Those who recorded their visitors were enthusiastic both as to their number and quality, as well as the great diversity of places represented. Not only were the men from all over this country, but from Australia, France, Germany, Great Britain, Japan, Mexico and elsewhere.

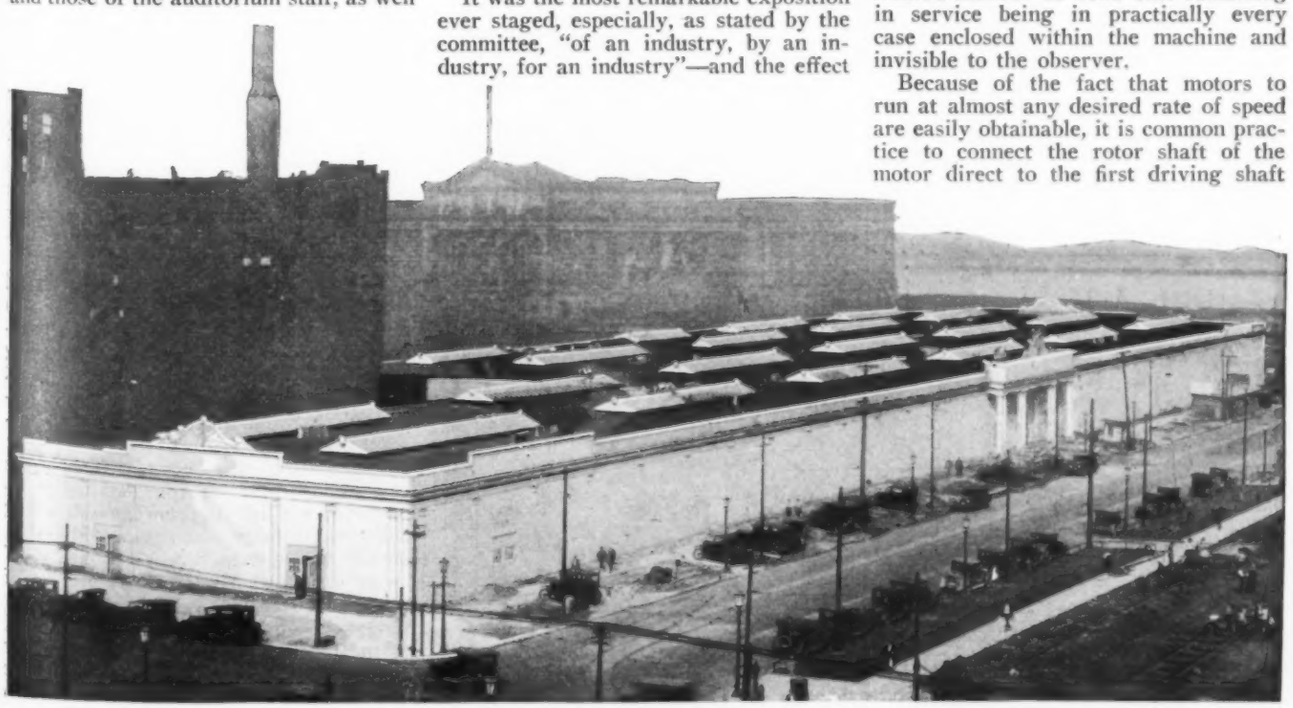
It was the most remarkable exposition ever staged, especially, as stated by the committee, "of an industry, by an industry, for an industry"—and the effect should be far-reaching on all concerned. The exposition committee—J. Wallace Carrel, P. E. Bliss, H. W. Dunbar, O. B. Iles and E. J. Kearney, together with Ernest F. Du Brul, general manager, and his staff—should be proud of the results secured and deserve the full appreciation of industry as a whole.

High Lights of the Show

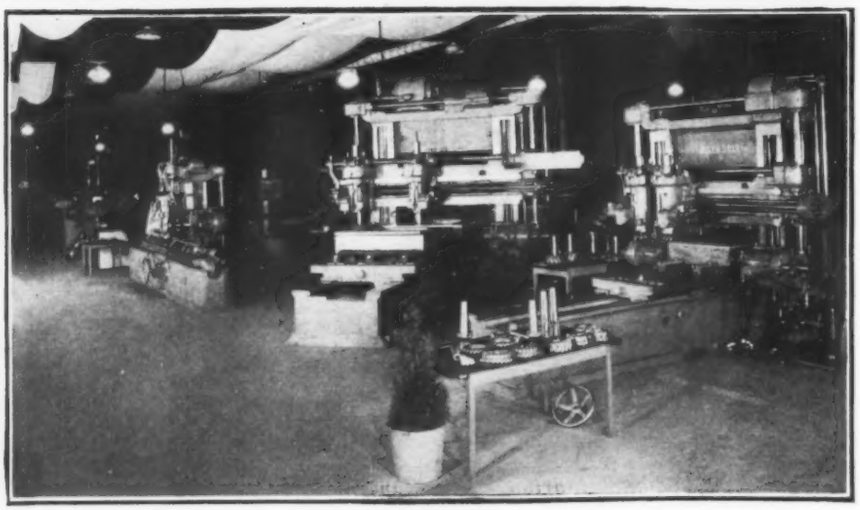
It is inevitable that the automobile industry, by far the largest single market for machine tools, should make its influence apparent in the design of the later models. The shift-gear box principle, primarily conceived by a machine tool man and later made an indispensable feature of the automobile, has again been applied to many of the machines in which frequent changes of speed through a considerable range is necessary.

Belting as a means of power transmission in machine tools has become almost a thing of the past. So universal has been the application of the individual motor that nowhere in the show was an overhead shaft visible; the limited number of belts still remaining in service being in practically every case enclosed within the machine and invisible to the observer.

Because of the fact that motors to run at almost any desired rate of speed are easily obtainable, it is common practice to connect the rotor shaft of the motor direct to the first driving shaft



The West Annex of the Public Auditorium at Cleveland



of the machine through some form of compensating coupling. In many of the machines having movements of adjustment in several directions, a corresponding number of motors is used, each motor driving the particular unit upon which it is mounted without reference to the other parts of the machine.

The unit drive method also leads easily to the power traverse and power setting features that hitherto have been performed manually, but are now operated by merely pushing a button that not only causes crossrail or saddle to be moved rapidly to approximate position, but on some machines to position the tool exactly within a degree of refinement that a few years ago would hardly have been considered practical by any means.

Wherever it is impracticable or inconvenient to connect the motor directly to the driven member the power is transmitted through some form of silent chain or belt, which thus provides considerable latitude in the matter of speed ratios, works well upon any center distance however short, and operates without noise.

As cut gearing is coming more and more into use as a medium of power transmission to the spindles, it is being superseded to a surprising extent in the auxiliary feed and traverse movements of the same machines by the hydraulic method, which is at once more flexible, more easily controlled and less liable to derangement and breakage. Of the two hydraulic drives in common use the cylinder and piston is the most frequently applied, though in some of the larger machines having long traverse movements a hydraulic rotary motor is connected directly to a pinion in mesh with a rack on the moving part. In this way there are no limiting factors in respect to length of movement inherent in the drive.

That cut gearing as a factor in machine construction is being given ample consideration, is evidenced by the number and variety of gear cutting and finishing machines on exhibition. Gear grinding after hardening seems to be almost common practice, as is also the method of burnishing by rolling the cut gears under pressure in mesh with hardened and ground master gears.

A great advance in the application of the grinding process was noticeable in the quantity and wide variety of grinding machinery on exhibition ranging from small internal spindles to grind holes $\frac{1}{8}$ in. in diameter up to huge surfacing machine absorbing the full capacity of 70-hp. motors.

Lubrication—the lack of which is the bugbear of the machine tool builder—has received its share of attention and there were many machines exhibited in which all important bearings are oiled from a central reservoir by means of force feed pumps. Both the circulating system in which a continuous flow of oil to the bearing and back through a filter to the reservoir, and the intermittent system that supplies a drop of oil to each bearing at stated and easily regulated intervals, are used.

Rigidity and strength of machine tools is increasing constantly. Though the ability to remove enormous chunks of metal in the shape of chips is not of necessity a part of modern high production methods the ability of a machine to do it is in a measure a test of its ability to withstand indefinitely the shocks of high pressure work without lowering its standard of accuracy and precision.

Anti-friction bearings, which have been brought to their present high state of accuracy and efficiency by the influence of the automotive engineer, are being incorporated into the design of machine tools to an ever increasing degree. Though not yet adopted to any great extent for the spindles of lathes they are nevertheless employed in some cases, while for the spindles of drilling and grinding machinery and even for milling machines their use is quite common.

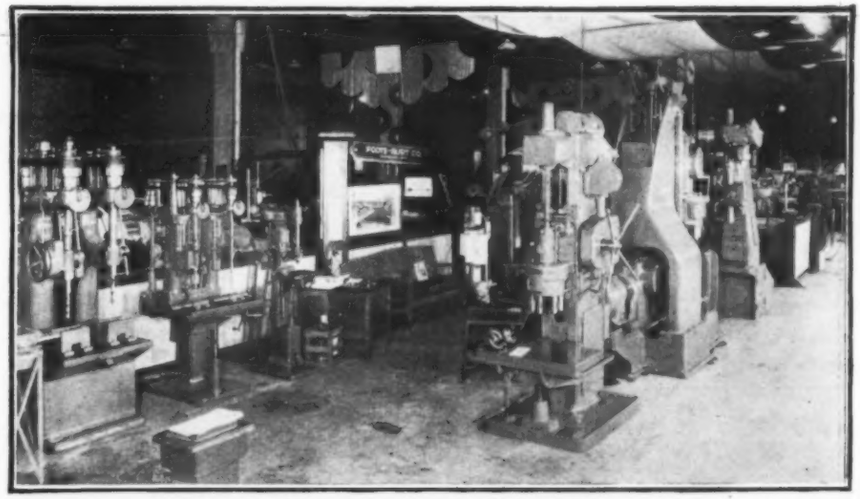
The standard spindle for milling machines, the design of which was adopted some months ago by practically all of the leading makes was very much in evidence, and seemed to be giving universal satisfaction. Though they have not yet made their appearances in actual practice, similar standardization schemes for other machines are under consideration.

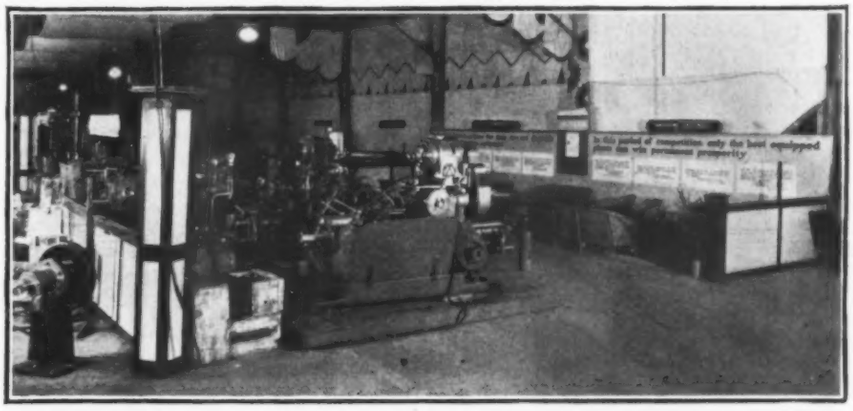
Machine Tool Congress Is Organized

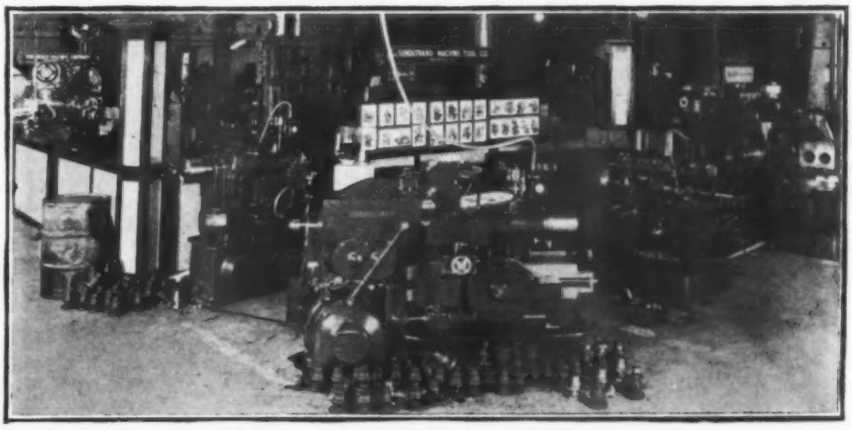
A new technical organization was launched on Sept. 21, the Machine Tool Congress being inaugurated with an introduction by James E. Gleason, president of the N.M.T.B.A., at whose suggestion Henry D. Sharpe presided at the first session. The opening talk was by Dr. P. G. Agnew, secretary of the Engineering Standards Committee, on the "Purposes and Advantages of Standardization," who pointed out that while the world had never before seen such wealth as in this country he believed that this can readily be increased. If the rate of increased production per man of a recent three-year period be continued—this being 14.4 per cent per man-hour—Dr. Agnew feels that living standards can be so improved that those who now constitute the masses, may be raised to the present standards of the middle class.

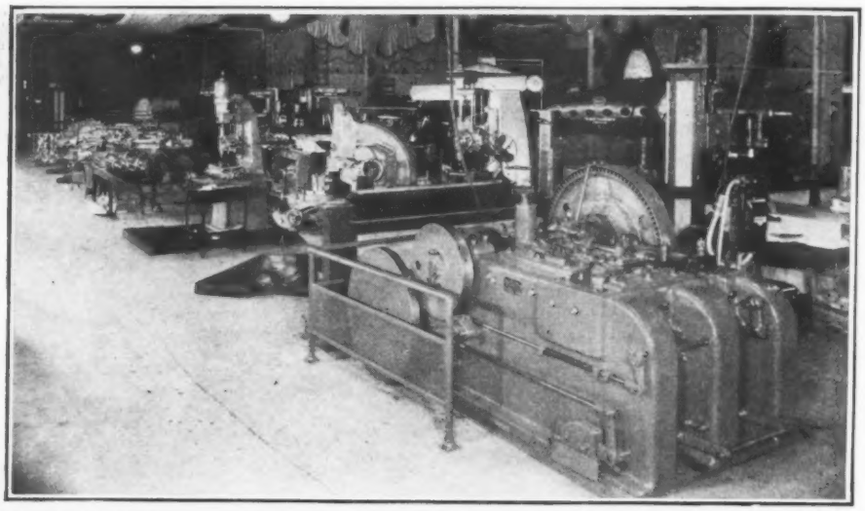
Among the desirable standards are those of quality and of nomanclature so that all in an industry may speak the same language. Standardization work is now going on in twenty countries, some of these giving it much more attention than is being done here.

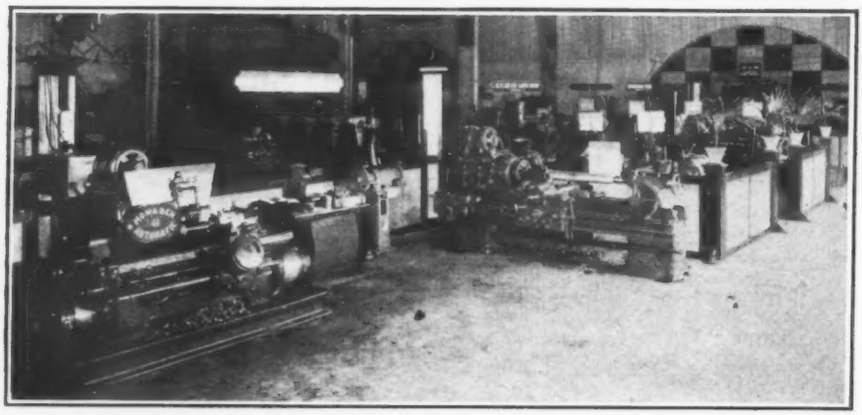
L. D. Rigdon of the Westinghouse Electric and Manufacturing Co., was unable to present his paper on "Standardization of the Machine Tool Industry as Seen by Users," and it was read by A. L. Stewart. It gave many interesting suggestions. He does not believe it advisable to attempt to standardize the internal design of machines but only such parts as affect the applications of tools and work holding fixtures. At present, however, the variation in T-slots prevents fixtures from being interchanged. Control levers should have

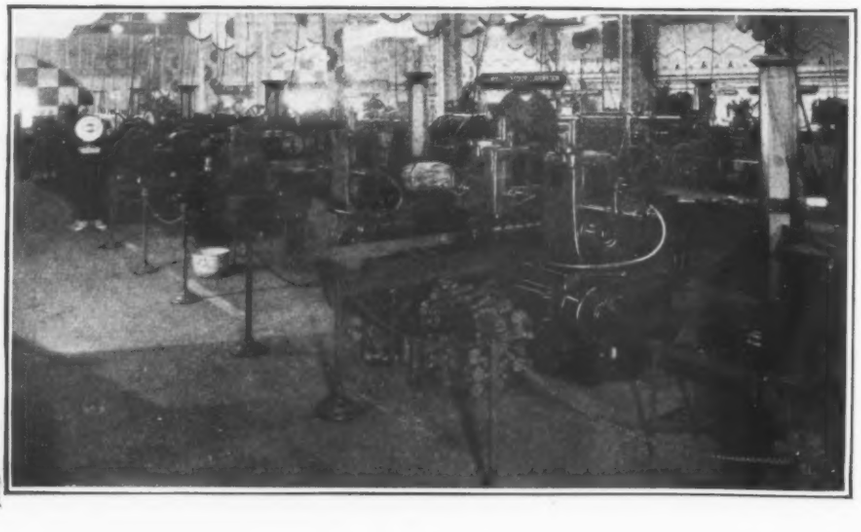












similar motions to secure various feeds and other movements so that operators can go from one machine to another without difficulty. Engine lathe spindle noses and tapers in both spindles and tailstocks should be standardized. Collets or spring chucks should also be alike on machines of different makes. Holes in turrets and tapped holes on turret faces should permit interchange of tools bolted to the faces.

James E. Gleason, president of the Gleason Works, read a paper on "Possibilities of Standardization as Seen by Machine Tool Builders." He pointed out that unless records were kept many truths are lost and have to be rediscovered. Standards, in his opinion, are an aid to engineers and not a hindrance.

Sol A. Einstein, of the Cincinnati Milling Machine Co. presented a paper on "Advantages of Standardization from the Engineering Standpoint," pointing out the stress being laid by the U. S. Department of Commerce on the importance of standardization, it being considered as the outstanding trend of the century. The machine tool industry has not shown much tendency toward standardization, the milling machine spindle nose being a notable exception. There are other standardizations under way but the progress is discouragingly slow to those who see its many advantages.

Mr. Einstein advocated that standards of machine tool capacity and performance be adopted so that a user may know just what the machine can do. Along with this would have to be a standardization of belt pull, on a belt driven machine, or motor requirements on the motor-driven machines.

Following the papers the Congress was formally organized, adopting a constitution and by-laws and electing nine directors. The directors are A. L. Stewart, K. H. Condit, J. L. Cochrane, for three years; Tell Berna, Erik Oberg, C. R. Burt, for two years; Guy Hubbard, Thomas Jones and R. A. DeVlieg, for one year.

Production Meeting of S.A.E. Debates Profits

Profits from the use of machine tools were discussed from two entirely different angles at the production meeting of the Society of Automotive Engineers in Cleveland, Sept. 19. E. P. Blanchard presided. Geo. T. Trundle, Jr. under the heading "Net Profits from Modern Machine Tools," drew from his wide experience to point out the tremendous savings that are possible by the use of modern machinery, emphasizing the important part that machine tools play in all industry. He pointed out how the policy of demanding that a machine tool pay for itself in one or two years was entirely wrong and that it must react against those who adhered to it.

Mr. Trundle pointed out that in most cases the accounting method was unfair to production, and to the whole concern. The usual method of charging off 10 or 15 per cent a year for depreciation, is merely a gesture, because, while this amount should go into a reserve fund for the replacement of equipment, this

is seldom done. In demanding that savings be accomplished the amount set aside for depreciation and the selling price of the old machine should be deducted from the price of the new machine. Using the net cost of the machine and tools, it is then fair to demand that it pay for itself in a reasonable time.

Funds on Paper Only

In too many cases the depreciation of equipment is merely a book figure and there is no money in reserve for new equipment. Unless the amount of depreciation is available, production has been robbed of its share of earnings and the firm will eventually suffer. Depreciation should always be available toward the purchase of new equipment. Unless this is done there is an inflated idea of profit. In other words money that should go to machine reserve, goes to dividends and other expenditures.

In the absence of Lee M. Beatty, of the Wright Aeronautical Corporation A. R. Fors presented his paper on "Manufacturing Methods Used in Building the Wright Whirlwind Engine."

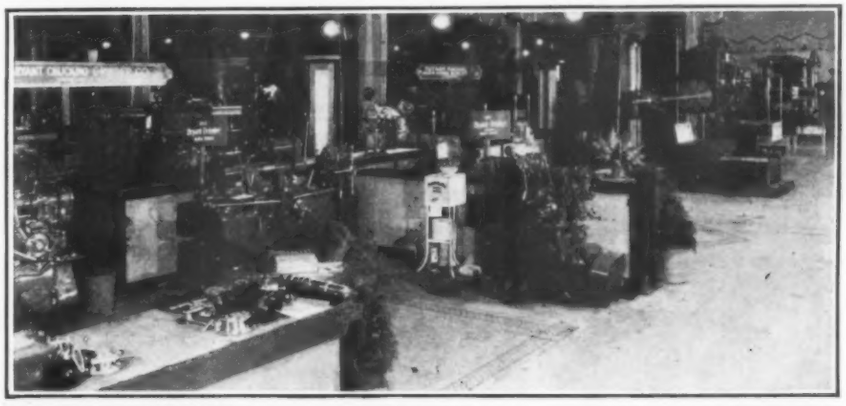
At the evening session, with A. H. Frauenthal as chairman, E. P. Blanchard of the Bullard Machine Tool Co., gave a very interesting paper on "Integrated Production," dealing with unit operations and the way in which they could be computed in making time and cost studies. He pointed out the use and advantages of multiple tooling and how dividing the cut between various tools reduced the time of the operation, coining the word "simultation" to represent the doing of various cuts simultaneously. All machining is a combination of work units and by integration we can break the operations down into parts that can be readily estimated.

Owing to the enforced absence of G. E. Bechtel, his paper on "Production Control" was not given. Chas. M. Ripley of the General Electric Co., gave a very interesting illustrated talk in its place.

At the final Cleveland session, with K. H. Condit presiding, the papers by R. C. Deale on "Application of Electric Motors to Machine Tools," by L. A. Becker on "External Grinding," by M. C. Hutto on "Developments in Cylinder Grinding," and P. H. Walker on "Process Used in Making Stones," were presented, Mr. Page substituting for Mr. Hutto.

The paper on external grinding deals with the finishing of crankshaft bearings by the use of abrasive stones in a manner similar to that used in finishing cylinders by the process commonly known as honing. The process is attracting attention and is being applied to other products than crankshafts. The making of these abrasive blocks used so as to secure a uniform structure was outlined in Mr. Walker's paper, and attracted considerable attention.

The attendance at the various meetings was very satisfactory and there seems to be an increasing interest on the part of production men in the work of the society.



Detroit Exposition Showed Treatment of S

Three hundred exhibitors occupied 93,000 sq.ft. of floor space with latest developments in operations on steel

ALMOST every operation on steel was included in the exhibits of the ninth annual Steel and Machine Tool Exposition, held in Detroit, Sept. 19 to 23, under the auspices of the American Society for Steel Treating. More than 300 exhibitors occupied 93,000 ft. of floor space. Steel, from its raw state to its application in finished form to such products as airplane engines and automobiles was shown. Machine operations, forging operations, heat-treatment, metal testing, welding, cutting and material handling were demonstrated. Two universities exhibited the work of their engineering and metallurgical departments.

A greater amount of the equipment was in actual operation than was the case in past exhibitions by the steel treaters. Exhibitors seemed also to have better realized the value of motion pictures which were frequently used to show operations that could not be demonstrated in an exhibit. The exhibits included also a racing car, a passenger chassis, and an airplane fuselage, as well as airplane engines, in order to show where steel is used in their construction. Automobile parts and a body were exhibited to show some of the work done in car fabrication.

An added feature of the exposition was the official participation of the American Welding Society and a larger amount of welding equipment was shown than has been previously exhibited. Manufacturers of this type of equipment showed both gas and electric welding apparatus. As in past years, the Society of Automotive Engineers held technical sessions. The meetings of both societies are reported elsewhere in these pages.

The following is a representative list of equipment exhibited at Detroit:

METAL WORKING MACHINERY:

Tapping attachments; bending and straightening tools; chucking machines; drilling and bench drilling machines; portable electric and pneumatic drills; engraving machines; flexible shaft machinery; grinding machines; high-speed and portable grinding equipment; hammers; jig boring machines; automatic, bench, engine, production and speed lathes; milling and bench milling machines; nibbling machines; planers; presses; drill presses; broaching presses; band, cut-off and hacksaws; electric screwdrivers; shears; spring-making machinery; wire coiling and drawing machinery.

RIVETING MACHINERY:

Electric riveting hammers; pneumatic riveting hammers; electric rivet heaters; riveting machines.

Steel in the Raw and Finished States

Motion pictures used to show such operations as could not be demonstrated in an exhibit

WELDING EQUIPMENT:
Electrodes; gas cutting and welding torches; electric arc, butt, seam and spot welders; thermit equipment.

FORGING EQUIPMENT:
Forging furnaces; forging hammers; forging and upsetting machines.

HEAT-TREATING EQUIPMENT:
Insulating brick; gas and oil burners; high-temperature cement; oil coolers; carbonizing and cyanide hardening furnaces; electric furnaces; electric pot furnaces; gas furnaces; metal melting furnaces; recuperators; retorts.

FINISHING EQUIPMENT:
Tumbling barrels; metal-cleaning compounds; rust-proof compounds; polishing machinery; parts-washing machines.

TESTING EQUIPMENT:
Balancing machines; micro-metallographic cameras; metallographic grinders; micro-metallographic microscopes; projectors; ductility, hardness, impact, sharpness, stress-strain, tension and universal testing machines.

GAGES AND INSTRUMENTS:
Gas analyzers; barometers; gage blocks; cameras; temperature controllers; dial, precision and vacuum gages; speed indicators; micrometers; microscopes; pyrometers; thermocouples; thermometers.

SMALL TOOLS:
Arbors; boring tools; broaches; chucks; counterbores; cutting tools, (lathe, etc.); gear-tooth and milling cutters; forming and stamping dies; drills; files; hand tools; gear-tooth hobs; machine knives; laps; pipe tools; punches; reamers; rolls; band, circular and hack saws; taps and dies; tool holders; vises; abrasive wheels; wrenches; etc.

MATERIALS AND MISCELLANEOUS PARTS:
Bearings; bolts, nuts and rivets; brass; bushings; carbides; cyanides; drawing and pickling compounds; copper-molybdenum and pig iron; refractory materials; monel metal; nitrogen; molybdenum ores; oxygen; packing; anti-carbonizing paint; leader pins; heat-treating salts; die shoes; springs; carbon, chromium, chromium-tungsten, cold-drawn, high-speed and stainless steels; boiler and cold-drawn tubes; filler and copper-alloy welding wire, etc.

MISCELLANEOUS FACTORY EQUIPMENT:
Belting; blowers; boilers; gas and oil burners; air compressors; traveling cranes; fans; forges; shaft hangers; chain hoists; belt lacers; lighting equipment; furnace lining; lubricating equipment; magnets; marking equipment; electric motors; truck platforms; power

transmission equipment; pulleys; centrifugal and oil pumps; sieves; shafting; speed and variable-speed reducers; oil strainers; tractors; truck trailers; hoist trolleys; trucks.

This list does not purport to be a complete inventory of equipment, but is given as an indication of the scope of the exposition.

Hughes Nominated for President

Frederick G. Hughes, vice-president and director of the New Departure Manufacturing Co., was nominated for the presidency of the American Society for Steel Treating at the annual meeting held at Detroit, Sept. 21. Election will be by mail ballot this fall. Zay Jeffries, who for four years has been treasurer of the society, was nominated for vice-president, and J. M. Watson, of the Hupp Motor Car Co., was nominated for treasurer for a term of two years. W. H. Eisenman will continue as secretary. The nominating committee named as directors T. E. Barker, of the Accurate Steel Treating Co., and W. H. Phillips of the Climax Molybdenum Company.

At the annual meeting several amendments to the constitution were acted upon and carried by the society.

The report of Pres. Harper contained the announcement that Dr. W. R. Whitney, director of research of the General Electric Co., and Chas. F. Kettering, director of the research laboratories of the General Motors Corporation, have been added to the roll of honorary members.

In his report, Pres. Harper said, "The work of the individual is the reason for the success of the society. The untiring efforts of the various members acting in their chapters and on various committees have been remarkable, and I wish to express my appreciation to them. It would be impossible to mention all of the examples of the wonderful co-operation which has been shown during the past year."

He praised the work of Dr. Zay Jeffries, who has developed a financial budget system for the organization, and of Prof. H. M. Boylston, head of the publication committee. The increase of practical articles and the improved form of the *Transactions* he credited to Ray T. Bayless, the editor, and to the committee.

It was announced in the report that the practice of having two sectional meetings would be abandoned and one semi-annual meeting substituted. The next semi-annual meeting will be on Feb. 16 and 17, at Montreal. The next annual convention will be held during the week of Oct. 8, 1928, at Philadelphia.

In the report of the secretary, Wm. H. Eisenman, it was pointed out that the 1927 exposition was the best rounded and largest the society has ever held. Slides were used to show the growth of the society and of the grades of junior, associate, full member, as well as total membership. In 1920 there was a total membership of 1,724, while at the pres-

ent time there are 4,653 members. The addition of 653 members so far this year is the largest increase the society has had. Dr. Jeffries in his annual treasurer's report pointed out the growth of the society's assets from about $16,500 in December, 1921, to $117,000 last month.

The Edward D. Campbell Memorial Lecture was delivered by Dr. Zay Jeffries at a meeting presided over by Prof. A. H. White of the University of Michigan.

In his memorial lecture, Dr. Jeffries not only summarized the work of Prof. Campbell but discussed its theories and the facts discovered in the light of present day development. Many theories developed at a time when present day instruments were not available to prove their truth have later been tested and found to be fact. Comments on the present status of steel research as well an on some of his own work were added by Dr. Jeffries whose paper was widely commented upon.

The papers presented to the society during the course of the week provided an unusually satisfactory program and this annual convention can be considered as the greatest that the society has yet had. Some of these papers have already been published in *American Machinist* in abstract form.

The Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers held a joint session with the American Society for Steel Treating on Wednesday afternoon at which time five papers were presented. These were "Physical Characteristics of Commercial Copper-Zinc Alloys," by W. H. Bassett and C. H. Davis; "Nickel and Monel Metal," by C. A. Crawford; "Wronght Zinc," by C. S. Trewin; "Commercial Forms and Applications of Aluminum and Aluminum Alloys," by P. V. Faragher.

Trips for the benefit of the steel treaters were arranged to cover a large number of plants in Detroit and its vicinity.

Record attendance characterized the fall meeting of the American Welding Society at the Book-Cadillac Hotel, in Detroit. A study of the papers presented, and of the new products exhibited in the welding section of the Steel Treaters' Show, indicates that the industry is on the way to becoming a machine industry. Abstracts of some of the papers will be published next week.

Approximately five hundred attended the banquet, at which the guests of honor were Charles F. Kettering, vice-president of the General Motors Research Corporation, and Dr. Willis R. Whitney, director of research for the General Electric Co. Both were presented with honorary membership in the A.S.S.T. in recognition of their services in metallurgical research.

W. P. Sykes was awarded the Henry Marion Howe gold medal for his paper on the constitution and properties of hardened steel. Robert M. Bird was presented with the Past President's Medal.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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THE fact that 150,000 people paid $3,000,000 to see the Chicago prize fight last week is cited as evidence of America's prosperity, and there is no doubt that it appealed to the imagination of the speculators who continued to buy stocks at the highest prices ever obtained for many of them.

But warnings against the danger of such purchases are not wanting, and no less an authority than John J. Mitchell, of the Illinois Merchants Trust Co., in Chicago, is quoted in a newspaper interview as saying: "Business is good and undoubtedly will continue so, but the antics of the stock market have put us in a dangerous mood.

"We are being encouraged to expect too much. The Federal Reserve Banks have helped this sentiment along by reducing their rates from 4 to 3½ per cent, thereby putting an actual premium on inflationary expansion.

"Many stocks are selling far too high simply because there is a plethora of cheap money. . . . It is not unlikely that the future course of the money market will make the 3½ per cent rate look ridiculous. There is $700,000,000 of French money on deposit in New York. It may be taken from the country any day. In addition we are coming into a period when there is a seasonal upturn in the demand for funds for fall expansion in business and crop moving purposes."

While some disparage this statement as expressing the views of an "old fogy," it was not without effect and toward the end of the week its influence became apparent in the decline shown by many of the securities that have been speculative leaders on the Stock Exchange and the curb markets.

Some of the bank stocks that have been recently boomed also displayed a reactionary tendency and in the Stock Market the feeling at the end of the week was less optimistic than it has been for some time.

This is not surprising when the procrastination shown by the expected revival of business is considered. Car loadings for the week ending September tenth were about 4 per cent under last year. Railroad earnings for August as far as published show a decline in the net. An increase in unemployment is reported in New York, Chicago and Detroit. It is estimated that 170,000 union coal miners are out of work and are likely to remain idle throughout the winter, as there is no scarcity of coal in sight. The "Steel Industry Fails to Improve" is the caption that appears over a trade paper's description of conditions in the iron and steel business.

As the automobile manufacturers are among the most important consumers of steel, the predicament in which they find themselves may partially explain the situation in the steel industry. The automobile production for August included 303,040 passenger cars and trucks, as against a total of 422,294 vehicles for the same month in 1926. This is a decrease of 28¼ per cent, and while most of it is chargeable to the Ford company, it represents a substantial reduction from the country's total business turnover, and the situation has not been improved by press dispatches from Detroit which indicate that the long expected new model will not be available in quantity until after New Years.

An ebbing in the tide of industrial activity is also indicated by a report from S. W. Straus & Co., which puts the decline in building during August at 9 per cent, and a statement that W. J. Bowen, president of the Bricklayers Union, has issued to the affiliated locals of his organization reads as follows:

"Observing the past, we cannot avoid the conclusion that the peak of activity in our trade has passed. There are many persons who will tell us that the high tide of employment will continue indefinitely. It is easy to make predictions of this kind and easy to accept them. It takes more courage to face the unpleasant facts, but it is wiser to accept them than to continue in a course that must lead to disillusionment.

"Employment today is not what it was a year ago, still less than what it was two years ago. It was to be expected that the period of unusual activity immediately following the war would come to an end. This downgrade is not a desperate decline, but it is down-grade nevertheless."

This is a counsel of conservatism and common sense which should do much good if it is heeded.

The most important foreign news of the week was the announcement that Dwight W. Morrow of the J. P. Morgan Co., has been appointed our Ambassador to Mexico. Great things are expected from him, and if he is successful in re-establishing an *entente cordiale* with our friends on the Southern side of the Rio Grande, the next great boom may date from the time that American capitalists shall feel that Mexico is a safe field for investment.

Meanwhile our domestic situation remains serene, and no uneasiness need be felt if the distention in the stock market shall be gradually corrected as now seems probable.

WHAT'S DOING IN INDUSTRY

THE MACHINERY and machine tool industry took a breathing spell last week while executives, engineers, purchasing agents and salesmen journeyed to Cleveland and to Detroit where they inspected what are said to have been the greatest expositions of mechanical equipment ever staged in the United States.

MEANWHILE, business at home ebbed. Sales effort was lessened and buying activity suspended for the time being. But the after effects are expected to be invigorating to an industry that has been more or less below normal during the summer season. Inquiries in larger volume have already forecast an Autumn business which should make up for the deficiencies of previous months. In Detroit the auto manufacturers are watchfully waiting expected developments, and much business is known to be pending. Chicago and Cincinnati are working on inquiries and leads furnished by the expositions.

IN THE EAST sales have quieted down but considerable buying activity is expected next month. New York, Buffalo, Philadelphia and the New England territory all report dormant sales activity, but prospects growing better each day. Taking the general situation in industry on the whole, and the impetus given by the new equipment just brought out by machinery manufacturers, October should see the beginning of a sales revival.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW ENGLAND

Substantial improvement in the volume of business booked by machinery builders in the New England territory is a subject of comment by manufacturers interviewed in a canvass of the industry. The orders received were not of such magnitude as to necessitate any expansion of operations, but will assure production at a fairly active pace. Farm machinery equipment builders and railroads were well represented in the buying of the past ten days.

The consolidation of the Farrel Foundry and Machine Co., of Shelton, and the Birmingham Iron Co., of Derby, as the Farrel-Birmingham was the outstanding business event of the week. The merged company will have $5,700,000 capital and Charles F. Bliss is president. Business of these companies is especially good at this time. The electric industry has been buying shop equipment in this territory, but the buying was regarded mostly of replacement variety.

BUFFALO

The machine tool trade is not showing expected activity for the last half of September. Dealers are surprised that there are not more inquiries and other signs of increased business activity. They believe, however, that the Cleveland show will have an extremely beneficial effect and will help business during the next few months.

Activity in the electrical end of the industrial equipment business is about on par with that of the machine tool industry. Two or three fairly big orders were placed in the electrical line within the last two weeks, but the general run of business is small. There is some increased activity in contractors equipment for building construction purposes. Competition continues keen in this line.

CHICAGO

Practically no change in the machine tool situation has developed within the last week, and none is looked for until the reaction to the Cleveland exposition has had time to be felt. Business generally is not what had been looked for by optimists. With an occasional exception, dealers report sales for September to be disappointing, although of better volume than for the first three weeks of August.

The most encouraging feature of present conditions is found in a marked increase in the number of inquiries from industrial sources. The principal buyers at this time are the manufacturers of farm implement machinery, who continue to inquire for and purchase needed equipment. Railroads are limiting their purchases, in the main, to single tools. Dealers in used tools report business as somewhat discouraging, but are hopefully looking for a revival of trade in the very near future.

DETROIT

There is a definite note of optimism in the machinery and machine tool field in Detroit. In spite of the fact that more than half of the dealers and their salesmen have been absent, sales have substantially increased. The convention at Cleveland has improved the morale of the dealers here and the receipt of some fair sized orders for equipment has lent substance to their optimism.

During the last week Paige, Dodge, Hudson, Ford and several of the General Motors units have been making purchases in varying amounts. A number of inquiries have been received for both standard and special equipment and the general feeling has improved within the past two weeks.

In a great many of the larger automobile plants there is an atmosphere of intense activity and in most of them an air of secrecy that seems to indicate portentious and significant happenings. The Ford plant is still the greatest center of industrial and public interest. The Department of Street Railways has made careful plans for the accomodation of many thousands of additional workmen going to and from the Fordson plant and all of the indications are that the plant will enter into an era of production that will be greater than any the company has ever experienced. In that event it is generally believed among machinery dealers that the next year will be a profitable one for them.

CINCINNATI

The majority of machine tool manufacturers in the Cincinnati district report that business livened up considerably in the last week, in spite of the fact that a great many prospective buyers were postponing the placing of orders until they had seen the exhibits at the Cleveland show. Selling agents report an increasing demand. While September sales have been somewhat below the volume expected, both branches of the trade are confident that there will be a general business revival in October.

The principal buyers in the past week were general machinists and miscellaneous users, located in all sections of the country. The majority of orders were for single tools and replacements. There were a few scattering export orders received from European countries, including England; some business from the South American oil fields is reported, as well as from the oil fields of Texas. Orders from railroads and automobile manufacturers were confined to replacements.

Manufacturers report the receipt of an increased number of inquiries during the week. A number of lists are reported out, but the majority of inquiries are for single tools and replacements.

MILWAUKEE

Business in metal working equipment is undergoing improvement since the exposition at Cleveland last week. The stimulation of buying is confidently expected to grow to even greater proportions, now that users have had an opportunity to inspect the latest designs of tools, and make comparisons for the purpose of selecting such that meet their needs. The results of the exposition confirmed the impression that many users were holding orders in suspense awaiting this inspection.

The trade is not expecting an abnormally broad demand, for there is as yet not apparent any broad need for equipment beyond the ordinary run of necessary replacements. Many shops are making minor additions to their layouts, but few are getting so large a volume of business as to make important extensions of capacity necessary. Industrial construction is now showing an upward trend, but the number of important projects being undertaken or contemplated is below the average.

Industries of a general character in the machinery and metal products field are the best customers of tool manufacturers. The automobile demand remains rather disappointing, but the situation of the industry is expected to clarify shortly. The farm machinery industry has been a comparatively good buyer for several months.

PHILADELPHIA

The Philadelphia machinery and machine tool market has been spotty during the last two weeks. There have been some hopeful inquiries from general industrialists seeking prices on equipment for replacements, and some leaders of the industry hold an optimistic view of the future.

There has not been much encouragement for quantity buying from railroad companies. One manufacturer announced his concern had received inquiries from some of the carriers which were in the market for small needs.

Dealers and producers of equipment for machine shops and those engaged in repair work report a hopeful outlook. Manufacturers of leather belting doing an extensive business with general industrial concerns reported business now is better than it was a month ago.

CLEVELAND

No material change in sales was evident in the past fortnight. It is generally believed that the machinery and machine tool business is on the up grade. Sales for September show an increase over August. Present sales are not confined to any industry but are general in scope. Railroads and the automotive industry made recent purchases.

Exhibitors at the Cleveland show are enthusiastic in their praise of the success of the exposition. It has developed a number of good prospects and has resulted in daily spot sales.

A point of interest to the machine tool industry is the increase in the construction of new factory buildings for Cleveland in the last two months. According to building permit statistics this class of construction shows an increase of 20 per cent over 1926.

NEW YORK

The absence of many of the dealers and agents from this market during the week of the Cleveland and Detroit shows had the effect of lessening sales activity. Many promising negotiations were suspended while buyer and seller journeyed to the Mid-West to attend the machine tool expositions.

However, the inquiry activity continued brisk, although most quotations asked for concern only one or two machines. No large lists are reported in the trade, but it is known that more than one will be issued as soon as purchasing executives return to the home offices. It is remarked that most orders being received now are from the smaller industrial user. The larger buyers are able to send engineers to the expositions and profit by thorough study of equipment at first hand. These buyers are holding off, but are expected to buy in the very near future.

The used-tool market is only fair, the recent announcement of two large auctions serving to dampen some prospective sales enthusiasm.

Foundry Equipment Men Meet at Cleveland

Over three-quarters of the actual membership of the Foundry Equipment Manufacturers' Association was represented at the regular fall meeting which was held at the Hotel Cleveland, on Sept. 20. Owing to the illness of Thomas W. Pangborn, of the Pangborn Corporation, Hagerstown, Md., president of the association, S. C. Vessy, of the W. W. Sly Manufacturing Co., Cleveland, vice-president, occupied the chair.

The quarterly reports of business conditions given by the individual members reflected a spotty condition coupled with the feeling that the volume of business would be satisfactory during the remainder of the year.

A resolution was passed authorizing a change in the statistical reports of the association covering sales, shipments, etc., whereby in the future these reports will embody an index figure which will make possible more accurate comparisons between the current figures and those for previous periods.

In a resolution which was passed unanimously it is claimed that the text of the pamphlet issued by the American Society of Mechanical Engineers, governing the award of the Lincoln Arc Welding prizes, contains statements and illustrations inimical to the welfare of the foundry industry, together with assertions which are erroneous and misleading concerning the suitability of castings for machine parts and other forms of engineering construction. The resolution requests the American Society of Mechanical Engineers to withdraw its sponsorship from this prize contest in its present form.

John W. Hill, financial editor of *Iron Trade Review*, Cleveland, spoke on "The Current Business Situation."

Frank C. Wight Dies

Frank C. Wight, editor of *Engineering News-Record*, one of the McGraw-Hill publications, who had served that journal and its predecessor, *Engineering News*, in an editorial capacity for twenty-one years, died at his home in Summit, N. J., on Sept. 18. Mr. Wight had been ill for only a week with an infected throat, though the fatal illness followed shortly his return to his desk after a nervous breakdown.

Born in Washington, D. C., Feb. 26, 1882, Mr. Wight studied at Columbian (now George Washington) University, and later at Cornell, where he received the degree of civil engineer. After graduation he spent three years in the office of the engineer of bridges of the District of Columbia. While on the staff of the engineer of bridges he had important service in the design and construction of the Piney Branch and Anacostia bridges and of the great Connecticut Ave. viaduct over Rock Creek Valley.

Mr. Wight's entry into the field of technical journalism dated from December, 1906, at which time he became associate editor of *Engineering News*. For six years his main assignments were in the fields of concrete, general construction and river and harbor work. In 1913 he was promoted to the managing editorship of *Engineering News*, a position which he held until *Engineering News* and *Engineering Record* were consolidated in 1917. Four years later he became managing editor of the consolidated journal, and on Jan. 1, 1924, Mr. Wight was made editor of *Engineering News-Record*. This position he held at the time of his death.

As an authority on reinforced concrete, Mr. Wight had contributed largely

Frank C. Wight

to the advancement of the art. His studies of the effect of sea water on concrete, his writings on reinforced-concrete design and construction and his work as a member and committeeman of the American Concrete Institute were notable.

Mr. Wight was a member of the American Society of Civil Engineers, the Cornell Society of Engineers, the American Concrete Institute, and the Engineers Club. He had for years been active in the work of both the National Conference of Business Paper Editors and the New York Editorial Conference. Of the former organization he was president at the time of his death.

Exports of Auto Parts

United States exports of automotive service appliances established a record export figure the first half of 1927, totaling $4,230,442 compared with $3,560,314 during the same period of 1926, according to the automotive division of the Department of Commerce.

These exports have had a large growth in recent years, from $1,076,359 in the calendar year 1923, increasing in 1924 to $2,841,453, in 1925 to $5,432,711, and in 1926 to $6,861,746.

The United Kingdom remains the best market for American appliances.

American S.A.E. Invited to British Motor Show

The Society of Automotive Engineers has been invited to attend the World Motor Transport Congress and the International Commercial Motor Transport Exhibition in England. The first event will take place in London Nov. 14 to 16; and the exhibition will be held at Olympia Nov. 17 to 26. The American engineers have been invited by the Institution of Automobile Engineers and by the Society of Motor Manufacturers.

Six subjects have been selected for discussion at the congress, namely:

(1) Road construction and improvement in relation to the development, efficiency and economy of road transport.

(2) Motor transport as an instrument of development of world resources.

(3) The necessity for co-operation between road and rail transport.

(4) The development of motor vehicles suitable for service on bad roads and for cross-country use.

(5) The improvement of facilities for international travel by road.

(6) Fuels and fuel supplies for road motor vehicles.

The Imperial Motor Transport Council has assured adequate representation at the congress so far as the British Empire is concerned. Government nominees will attend from the War Office, the Board of Trade, the Colonial Office, the India Office, the Post Office, and the Ministry of Transport, as well as from the Dominion of Canada, Australia, New Zealand, the Union of South Africa, and Newfoundland.

Members of the S.A.E. who are interested in the subjects that will be discussed and who find it practicable to accept the invitation, will undoubtedly make the trip in a body. The society is making arrangements to sponsor a party that will leave New York City on the *Berengaria* on Nov. 2, arriving in time for the opening of the World Motor Transport Congress, leaving England on the *Berengaria* on Dec. 6, and arriving in New York on Dec. 12.

Metallurgical Expert Appointed Editor

Arthur W. Allen, who is well known to the mining industry and who has for many years been a leading figure in the scientific study of metallurgy, has been appointed editor of *Engineering and Mining Journal*, a McGraw-Hill publication.

After serving several years in pursuing the study of metals for various mining and industrial companies in England, Australia, Mexico and South America, Mr. Allen entered journalistic work as a member of the editorial staff of *Engineering and Mining Journal*. He has recently been the editorial representative of that paper on the Pacific Coast. Mr. Allen is the author of several books on cyaniding processes and mining and metallurgical subjects.

Personals

N. R. CRAWFORD, for several years director of sales for the Industrial Works, Bay City, Mich., has resigned. No announcement has been made as to his future connection.

LOREN EMERY, merchandising sales manager for the International General Electric Co., has been appointed a member of the executive department and assigned to special duties in Mexico. He is succeeded by R. A. Rowlands.

M. H. MARKEY, of Lewisburg, Ohio, announces the opening of a new machine shop in that city. The plant is equipped with modern machines and is prepared to handle a variety of work on engines, farm machinery, and general metal working and fabrication.

GEORGE F. MOSHER, assistant to the treasurer of the General Electric Co., has been named auditor of disbursements, succeeding C. H. Stull, who has become treasurer of the Ohio Contract Purchase Corporation, an associated company, with headquarters in Cleveland.

R. G. SHULZE, European managing director for S. F. Bowser & Co., from London, England, has been spending several weeks at the plant in Fort Wayne, Ind. R. R. Dooley, assistant manager of the foreign department of this company, has returned to Fort Wayne following an extensive trip to Brazil, South America.

EARL L. SHANER has been appointed editor-in-chief of the *Iron Trade Review*. He succeeds C. J. Stark, president of the Penton Publishing Co., who resigned as editor to devote his time to executive duties. Mr. Shaner has served the *Iron Trade Review* for over eleven years in an editorial capacity, first as engineering editor. He has been active in trade association work, being for several years secretary of the papers committee of the American Foundrymen's Association. He is a mechanical engineer, graduated from Purdue University.

W. B. WOODHOUSE, general manager of the Yorkshire Electric Power Co., and a past-president of the British Institution of Electrical Engineers, is visiting Canada and the United States this month to acquaint himself with recent electrical engineering progress. Mr. Woodhouse, who has been prominently identified with the development of electrical power supply in Great Britain, is president of the British Electrical Research Association, a past-president of the Electrical Development Association, and a British delegate to the International Electric Commission.

Business Items

The Seneca Electric Welder Sales Corporation, of Detroit, and Welding Service, Inc., of San Francisco, have been licensed under the Holslag-Arendt patents.

The Witt Steel Co., of Greensburg, Pa., announces the change of its name to the Witt-Humphrey Steel Co. No change in personnel is included.

The Worthington Pump and Machinery Corporation announces the centralization of its Diesel engine building activities in the improved Snow Works of the corporation at Buffalo.

The Willard Machine Corporation has purchased the plant in Buffalo formerly owned and occupied by the Houde Engineering Corporation. The latter company is moving to a new plant in the same city.

The Alliance Tank Co., of Cleveland, announces an increase in the capital stock of the company from $60,000 to $95,000. This company was organized in May last year to manufacture steel tanks and other plate work, using the Lincoln welding processes.

The Mitchell Engineering Co., of Springfield, Ohio, has purchased the complete line of special threading and tapping machinery formerly manufactured by the Webster & Perks Tool Co. Repairs and replacements will be handled.

Smith & Wesson, Inc., of Springfield, Mass., which has been idle throughout the summer months, will reopen its plant at once with a force of 550 hands. The company held its annual meeting recently, and made this announcement. All officers of the company were re-elected.

Cincinnati Grinders Inc., of Cincinnati, Ohio, announces the completion of four series of still pictures, for use on the screen, giving views of installations of cylindrical grinding machines in leading plants in this country and abroad. The films are available to educational institutions, apprentice schools, foremen's clubs, and engineering societies.

The Monarch Machine Tool Co., of Sidney, Ohio, has released to its branch offices and to dealers handling its line, a standard moving picture film showing the methods of manufacture of Monarch tools, the operation of shop equipment and some of the finished Monarch tools in actual production work. The film is of the size for convenient transportation and can be shown with little preparation in offices or shops.

The American Electric Motors Co., of Milwaukee, with works at Cedarburg, Wis., has been acquired by the Splitdorf Electric Co., subsidiary of the Splitdorf-Bethlehem Electric Co. The new owner is seeking additional labor and will install new equipment to enlarge the production to include all sizes of stationary electric motors up to 30 hp.

The Farrel-Birmingham Co., Inc., of Ansonia, Conn., was granted a state charter of incorporation on Sept. 19. The new organization is a merger of the Farrel Foundry and Machine Co. and the Birmingham Iron Foundry Co., and will engage in a foundry and metal products business. The incorporators are: Alton Farrel, Charles F. Bliss, both of Ansonia; and F. D. Wanning, of Derby.

The McCabe & Sheeran Machinery Corporation, of New York, announces that it has taken over the sale of the entire machinery equipment of the Blake & Knowles Works, at East Cambridge, Mass. Representatives of the corporation are now at the plant. The manufacturing operations of the Worthington Pump and Machinery Corporation, which have been carried on at this plant, have been transferred to other associate plants.

Middleton, Eden & Co., has been organized by Nathan A. Middleton and Charlton G. Eden, of Cleveland, Ohio, to render service in industrial fields, and especially in the automotive industry. The primary purpose of the organization is to sell manufactured products, to develop sources of supply and to finance industrial corporations. The organization maintains an engineering department for research and design to secure efficient costs of manufacture and is especially interested in the development of patents and ideas.

The fifth annual salesmen's meeting of the Mueller Brass Co., of Port Huron, Mich., was held Sept. 6 to 9 at the Mueller Golf and Country Club in that city. Twenty-five sales representatives from all parts of the country attended the conference. Papers and talks delivered by officials and executives of the company, together with inspection trips through every department of the mill, gave the sales representatives a panoramic and intimate view of every phase of the business.

The Alexander Milburn Co., 1416-1428 West Baltimore St., Baltimore, Md., manufacturer of welding and cutting apparatus, carbide lights, oil burners and preheaters, and paint and lacquer spraying equipment, has organized an office in Boston to be known as the Alexander Milburn Sales Co., at Wiggin Terminals Bldg., 50 Terminal St. This office is under the supervision of M. B. Crouse and G. B. Malone, and will handle the sale and distribution of Milburn equipment throughout the New England States.

The Thompson Aeronautical Corporation, a subsidiary of the Thompson Products Co., Cleveland, has completed the construction of a modern hangar at the Cleveland Airport. The new hangar is 70x100 ft. and has a clear span. The clearance under the steel trusses will permit the accommodation of ships higher than any of those in use today. The office and stores department adjoins the hangar on one side. A well arranged stores and stockroom occupies the rear section. Airdrome flights, contract work, flying instruction and other services are provided for in this hangar.

A. E. Clifford Dies in Cleveland

Arthur E. Clifford of Wynnewood, Pa., business manager of *Automotive Industries*, dropped dead in the Union Station, Cleveland, Ohio, on Sept. 20. Mr. Clifford was for many years connected with the McGraw Publishing Co. and its successor, the McGraw-Hill Publishing Company, Inc., as business manager of the *American Electrician* and the *Electrical World*. In December, 1923, he resigned the position he then held as assistant to President James H. McGraw to join the business staff of *Automotive Industries*.

Speaking of Mr. Clifford's death, Mr. McGraw said: "Both capacity and courage were conspicuous characteristics of Arthur Clifford, whose earnest and devoted work will long be remembered by those for and with whom he labored. A large circle of friends in the McGraw-Hill Publishing Company and the United Publishers' Corporation, as well as in the other circles where he mingled, will miss him for his sterling personal and business qualities."

Forthcoming Meetings

American Gear Manufacturers Association. Fall meeting, Mount Royal Hotel, Montreal, Canada, Oct. 20, 21 and 22. T. W. Owen, secretary, 2443 Prospect St., Cleveland, Ohio.

American Aeronautical Exposition. First event, under the auspices of a committee of which Major General John F. O'Ryan is chairman; to be held at the 258th F. A. Armory, New York City, Oct. 20 to Nov. 6. Headquarters of the committee, 17 East 45th St., New York City.

American Institute of Steel Construction. Annual convention at Pinehurst, North Carolina, Oct. 25 to 29. Charles F. Abbott, executive director, 285 Madison Ave., New York City.

National Association of Manufacturers. Annual convention, Read House, Chattanooga, Tenn., Oct. 25, 26 and 27. George S. Boudinot, secretary, 50 Church St., New York City.

American Society of Mechanical Engineers. National management meeting, Rochester, N. Y., Oct. 26-27. Charles W. Lytle, chairman, Management Div., 29 W. 39th St., New York City.

National Founders Association. Convention, Hotel Astor, New York, N. Y., Nov. 16-17. J. M. Taylor, secretary, 22 S. La Salle St., Chicago.

American Society of Mechanical Engineers. Annual meeting, Engineering Societies Bldg., New York City, Dec. 5 to 8. C. E. Davies, assistant secretary in charge of meetings, 29 West 39th St., New York City.

National Exposition of Power and Mechanical Engineering. Sixth annual event in the Grand Central Palace, New York, Dec. 5 to 10. Charles F. Roth, manager, Grand Central Palace, New York City.

American Association for the Advancement of Science. Second Nashville meeting, Nashville, Tenn., Dec. 26-31, general headquarters Andrew Jackson Hotel. General chairman, W. S. Leathers, M.D., professor of preventative medicine and public health, Vanderbilt Medical School, Nashville, Tennessee.

The Weekly Price Guide

Rise and Fall of the Market

RAILS, fabricated steel structurals, and agricultural implement material continue in good demand at principal centers of consumption. Steel mill operations are at least 25 per cent below a year ago. Buying is definitely slower, at the present time, in steel bars, structural shapes, tank plates, sheets (except black), pipe and strips. The non-ferrous metals market is fully as depressed as that of steel. Price declines of the week were conspicuous in tin, zinc, antimony, babbitt metal (highest grade and No. 4) and solder. Linseed oil is weaker in the West. The coke market displays no evidence of improvement. Bars, shapes and plates are $1.75 per 100 lb., base, Pittsburgh, for lots involving several carloads; a single carlot or less, brings $1.85 per 100 lb.

(All prices as of Sept. 23)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	17.75
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.25	3.50	3.25	3.89
No. 12	2.30	3.55	3.30	3.94
No. 14	2.35	3.60	3.35	3.99
No. 16	2.45	3.70	3.45	4.09
Black				
Nos. 18 to 20	3.05	3.75	3.55	4.00
No. 22	3.20	3.90	3.70	4.15
No. 24	3.25	3.95	3.75	4.20
No. 26	3.35	4.05	3.85	4.30
No. 28	3.50	4.20	4.00	4.45
Galvanized				
No. 10	3.15	4.10	3.95	4.25
Nos. 12 to 14	3.25	4.20	4.05	4.35
No. 16	3.35	4.30	4.15	4.45
No. 18	3.50	4.45	4.30	4.60
No. 20	3.65	4.60	4.45	4.75
No. 22	3.70	4.65	4.50	4.80
No. 24	3.85	4.80	4.65	4.95
No. 26	4.05	5.05	4.90	5.20
No. 28	4.30	5.30	5.15	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded.	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded.	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches — ⅛	¼	⅜	½	1	1½	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
065"	16	.19	.20	.21	.22	.23	.25	.27
083"	14	.20	.22	.23	.24	.25	.27	.29
095"	13	.21	.23	.25	.26	.27	.29	.31
109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or 125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn, round and hex.†	4.00	3.65	3.60
Cold drawn, flats and squares	4.50	4.15	4.10
Structural shapes (base)	3.34	3.00	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.65	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ¼, 7.85c.; 5/32 to ⅜, 7.35c. per lb. *Flat, 5/16@¼-in. thick. †Shafting and screw stock.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots

Copper, electrolytic, up to carlots, New York	14.50		
Tin, pigs, 5-ton lots, New York	62.50		
Lead, pigs, up to carlots, E. St. Louis	6.10	New York	6.87½
Zinc, slabs, up to carlots, E. St. Louis	6.20	New York	7.12½

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	13.50	16.50	13.00
Copper sheets, base	22.00	22.00	22.00
Copper wire, base	18.75	18.75	15.25*
Copper bars, base	21.50	21.50	21.50
Copper tubing, base	24.00	24.62½	24.00
Brass sheets, high, base	18.25	18.25	18.25
Brass tubing, high, base	23.12½	23.12½	23.12½
Brass rods, high, base	16.00	16.00	16.00
Brass wire, high, base	18.75	18.75	18.75

*Mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	26@27	26.02
Zinc sheets (casks)	11.00	11.55	10.11
Solder (½ and ½), (case lots)	38.50	40.50	38½@42½

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	82.00
Commercial genuine, intermediate grade	61.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	12.50

Nickel, f.o.b. refinery, cents per lb.:

Ingots	35.00	Electrolytic	39.00
Shot			36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper	11.25 @11.50	10.75	10.00@10.50
Copper, heavy, and wire	10.75 @11.25	10.75	9.75@10.25
Copper, light, and bottoms	9.50 @10.00	9.25	8.75@ 9.25
Heavy lead	5.00 @ 5.25	5.25	4.50@ 5.00
Tea lead	4.00 @ 4.25	3.75	3.50@ 4.00
Brass, heavy, yellow	7.00 @ 7.25	7.00	6.75@ 7.25
Brass, heavy, red	8.75 @ 9.25	9.50	8.75@ 9.25
Brass, light	5.25 @ 5.50	5.50	5.75@ 6.25
No. 1 yellow rod turnings	7.50 @ 7.75	7.00	6.75@ 7.25
Zinc	3.75 @ 4.00	3.25	3.00@ 3.50

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.15½	36.00 per M	15
Sal soda, per lb	.03¾	02	02¾
Roll sulphur, per lb	.02¾	03½	04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.86¼	.94	81
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	65	.50	50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	27	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	30–10–5%
Heavy grade	30–10%	30–10%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb.	.16	.16	.17½
Solder (½ and ½)	per lb.	.385	.40	.435
Cotton waste, white	per lb.	.10@13½	10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.10
Lard cutting oil	per gal.	.65	.65	.55
Machine oil	per gal.	.27	.27	.35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in., full kegs.	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5.13	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville, 3.25@3.75	
Coke, prompt foundry, per net ton		Connellsville, 4.25@4.75	
White lead, dry or in oil,	100 lb. kegs	New York, 13.75	
Red lead, dry,	100 lb. kegs	New York, 13.75	
Red lead, in oil,	100 lb. kegs	New York, 15.25	

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Broken Kegs or Cases	Full Kegs or Cases
Machine bolts, square heads and nuts:		
Up to ¾ x 6-in.	50%	50–10%
Larger up to 1 x 30-in.	45%	50%
1⅛ and 1¼ in. dia.	30%	35%
Carriage bolts:		
Up to ½ x 6-in.	50–10%	.....
Larger sizes	50%	.....
Coach and lag screws:		
Up to ½ x 6-in.	50–10%	.....
Larger sizes	50%	.....
Tap bolts, hexagonal heads	45%	.....
Nuts:		
Hot pressed, square and hexagonal, blank or tapped	45%	50–10%
Cold punched, square and hexagonal, blank or tapped	45%	50–10%
Semi-finished, hexagonal, tapped, in packages	40%	.....
Case hardened, hexagonal, tapped, in packages	30%	.....
Washers: Deduct from list, per 100 lb.	$1.50	$3.50
Rivets, button and cone head:		
Small, including 7/16-in. dia.	.....	50–10%
Large (base) per 100 lb.	$6.50	$5.00

EXTRA per 100 lb. on rivets: For ½-in. dia., 35c.; ⅝-in., 15c.; 1-in., 5c.; length 1-in. and shorter, 25c.; longer than 1-in. up to and including 1½-in., 15c.; longer than 5-in., 25c.; standard countersunk head, 25c.

Machine Requirements and Industrial Construction

Equipment Wanted

Mass., Everett—(Boston P. O.)—Maltzman & Rovner, 22 Summer St.—miscellaneous tools and equipment for proposed repair and service garage. Estimated cost $40,000.

Mo., Valley Park—Barbour Boat Works—power punch and shear, ½ capacity.

O., Defiance—Defiance Stamping Co., C. V. Shepler, Mgr.—equipment including two stamping machines, one milling machine, one automatic drilling machine, etc. for proposed new metal working shop.

O., New Breman — The Streine Tool & Mfg. Co.—one 10 or 15 ton overhead electric crane, 40 to 50 ft. span, also two 10 ton or one 5 and one 15 ton electric cranes.

Tex., Temple—The Texas Aero Association — mechanical tools and equipment (later) for proposed additional unit to plant.

Ont., Winchester—N. F. Beach Co.—complete machinery and equipment for proposed furniture factory to replace fire loss. Estimated cost $200,000.

Que., Montreal — S. Schenkman, 5056 Sherbrooke St. W.—complete equipment for proposed auto repair shop, service station and garage.

Que., Montreal—International Harvester Co. of Canada Ltd., 5267 De Gaspe St.—complete equipment for proposed 2 story, 110 x 150 ft. repair and service station.

Opportunities for Future Business

Ala., Birmingham—Birmingham Galvanizing Co., recently organized, plans the construction of a new steel galvanizing plant. Estimated cost including equipment, $75,000.

Ala., Birmingham — Hardie-Tynes Mfg. Co., 800 North Twenty-Eighth St., is reported to rebuild foundry, machine and pattern shops recently destroyed by fire. Loss $100,000.

Conn., East Hartford—Connecticut Auto Parts Co., Connecticut Boulevard, awarded contract for a 1 story, 60 x 150 ft. garage and service station. Estimated cost $40,000.

Conn., Meriden—Bassick Co., Center and Britannia Sts., will soon award contract for the construction of a 2 story, 60 x 150 and 75 x 100 ft. factory for the manufacture of casters, etc. Estimated cost $40,000. Fletcher Thompson, Inc., 542 Fairfield Ave., Bridgeport, Archt.

Conn., Norwalk—Russell Frost, 50 West Ave., awarded contract for a 2 story repair and service garage at Park St. and West Ave. Estimated cost $40,000.

Ill., Chicago—American Casting Co., 6825 South Irving Ave., plans the construction of a 1 story, 72 x 125 ft. foundry. Estimated cost including equipment, $21,000.

Ill., Chicago — Regan Construction Co., awarded contract for a 2 story, 125 x 200 ft. factory. Estimated cost $45,000. Scientific Precision Co., Arthington St. and Tripp Ave., manufacturers of laboratory supplies and precision instruments, etc. lessee.

Ill., Rockford—National Chair Co., 1827 Broadway, awarded contract for the construction of a 1 story, 40 x 130 ft. addition to factory.

Ind., Hammond—J. Emmerling, is having plans prepared for a 1 story, 63 x 150 ft. machine shop and garage on Douglas St. Estimated cost $41,000. M. Turner, 633 Hohman St., Archt.

Ind., Indianapolis — Chevrolet Co., 540 East Washington St., awarded contract for a 3 story, 62 x 195 ft. machine shop and garage at 552-558 East Washington St. Estimated cost $85,000.

Ia., Waterloo — Silvers Mfg. Co., 710 Linden St., manufacturers of sheet metal products, awarded contract for a 1 story, 120 x 160 ft. factory.

Mass., Arlington (Boston P. O.)—J. J. O'Brien, Massachusetts Ave., awarded contract for a 1 story repair and service garage. Estimated cost $40,000. Noted Sept. 1.

Mass., Boston—Studebaker Sales Co., 109 Brookline Ave., awarded contract for the construction of a 2 story, 105 x 245 ft. garage, sales and service station at Jersey and Boylston Sts.

Mass., Cambridge (Boston P. O.)—Klauer Bros., 345 Franklin St., will soon award contract for a 1 story repair and service garage. Estimated cost $40,000. W. W. Drummey, 80 Boylston St., Boston, Archt.

Mass., Cambridge (Boston P. O.)—W. S. Young, 18 Webster St., Brookline, is having preliminary plans prepared for the construction of a garage on Church St., here. H. F. Bryant, 334 Washington St., Boston, Archt.

Mass., Dorchester (Boston P. O.)—Transit Dept., Boston, is having plans prepared for a 1 story garage, etc. at Fields Corner here. Estimated cost $100,000. E. R. Springer, 1 Beacon St., Boston, Engr.

Mass., New Bedford—City, W. P. Hammersley, Supt. of Street Dept., Municipal Bldg., awarded contract for a 1 story machine shop and garage on Smith St. Estimated cost $50,000. Noted Sept. 22.

Mass., Waltham (Boston P. O.)—Owner, c/o W. H. Haines, 32 Riverview Ave., Archt., is receiving bids for a 1 story, 60 x 100 ft. repair and service garage on Main St. Estimated cost $50,000. Noted July 14.

Mass., Worcester—Norton Co., New Bond St., awarded contract for a 1 story, 80 x 130 ft. factory. Private plans.

Mass., Watertown (Boston P. O.)—Lewis, Shepard & Co., 124 Walnut St., Boston, machinery manufacturers, awarded contract for a 1 story, 65 x 160 ft. addition to factory, here.

Minn., St. Paul — American Farm Machinery Co., Como Ave., awarded contract for a 1 story, 56 x 75 ft. addition to foundry. Estimated cost including equipment, $50,000.

Minn., St. Paul—Joesting & Schilling Co., will build a 2 story, 40 x 90 ft. addition to factory for the manufacture of hotel and restaurant equipment at Third Ave. and Sibley St. Estimated cost $50,000. N. E. Mohn, 596 Endicott Bldg., Archt.

Minn., White Bear Lake—Kiddie Plane Mfg. Co., 2219 Charles St., St. Paul, will build a 2 story, 100 x 200 ft. factory, here. C. E. Davies, White Bear Lake, Archt.

Miss., Jackson — Robinson Bros. Motor Co., East Capitol St., will build a 2 story, 85 x 145 ft. garage and service station at Amite and McQuade Sts. Estimated cost $40,000. Noted Aug. 25.

Mo., St. Louis—Grace Sign & Mfg. Co., 3601 South Second St., awarded contract for the construction of a 1 story, 75 x 260 ft. addition to factory at Second and President Sts.

Mo., St. Louis—William King & Associates Inc., 117 South Broadway, will soon receive bids for a 6 story, 103 x 200 ft. garage at 13th and St. Charles Sts. Estimated cost $500,000. W. J. Knight & Co., Wainwright Bldg., Engrs.

Mo., St. Louis—Missouri Pacific R.R., Railway Exchange Bldg. awarded contract for a 3 story, 133 x 144 ft. blacksmith shop, etc. at Ewing Ave. and Missouri Pacific R.R. Estimated cost $90,000.

Mo., St. Louis — J. J. Stedelin, c/o Aegerter & Bailey, 1904 Railway Exchange Bldg., Archts., awarded contract for a 1 story, 75 x 213 ft. garage at West Pine Blvd. and Spring St.

Neb., Omaha—Nebraska Buick Auto Co., L. Huff, V. Pres. and Mgr., 19th Ave. and Howard St., will build a 3 story addition to garage and service station. Estimated cost $100,000. J. T. Allan & N. S. Wallace, Brandes Theatre Bldg., Archts.

N. J., Carteret — I. T. Williams & Son, Woodbridge Ave., are receiving bids for a 2 story, 70 x 100 ft. sawmill, etc. Estimated cost $60,000. F. L. Smith, 21 East 40th St., New York, Engr.

N. J., East Orange—Baldwin Construction Co., Central Ave., is receiving bids for a 2 story, 120 x 200 ft. garage, etc. Estimated cost $150,000. E. V. Warren, 31 Clinton St., Archt.

N. J., Kearny—Western Electric Co., Inc., Lincoln Highway, awarded contract for a 1 story, 100 x 300 ft. telephone cable and switchboard plant. Estimated cost $200,000.

N. J., Newark—Kantor Bros., 205 Waverly Ave., manufacturers of plumbers' equipment and supplies, had plans prepared for a 2 story, 102 x 200 ft. factory. Estimated cost including equipment $40,000. A. J. Silberstein, 60 Park Pl., Archt.

N. J., Ridgefield Park—M. Zimmerman, 336 Main St., is having plans prepared for a 2 story, 75 x 200 ft. garage on Spruce St. Estimated cost $150,000. F. Meisler, 163 Main St., Hackensack, Archt.

N. Y., Brooklyn—Bullard-Murtha Motor Co. Inc., 902 Quentin Rd., awarded contract for a 3 story repair and service garage. Estimated cost including equipment $150,000.

N. Y., Harrison — Intertype Corp., 300 Furman St., Brooklyn, manufacturers of typesetting machines, will receive bids until Oct. 15 for a 1 story factory on West St., here. Estimated cost $500,000. The Ballinger Co., 100 East 42nd St., New York, Archt. and Engr.

N. Y., Poughkeepsie — Dept. of Public Works, Division of Highways, A. W. Brandt, Comr., Albany, will soon award contract for two 2 story additions to garage and repair shop, near here.

Okla., Tulsa—Owner, c/o N. B. Fleming, Bliss Bldg., Archt., is having plans prepared for a 4 story, 100 x 140 ft. garage on Cincinnati St. Estimated cost $150,000.

Pa., Erie—Joseph Zern, plans the construction of a plant including foundry, machine shop, pattern shop, etc. Wilbur Watson & Associates, 4614 Prospect Ave., Cleveland, O., Archts. and Engrs.

Pa., Philadelphia—Ware Bros., c/o P. S. Tyre, 114 South 15th St., awarded contract for a 2 story, 95 x 118 ft. sales and service station at 57th and Walnut Sts. Noted Sept. 22.

Tenn., Chattanooga — American Hoist Corp., manufacturers of electric elevators, etc. plans the construction of a new plant. Estimated cost $100,000.

Wash., Wenatchee—Great Northern Ry. Co., St. Paul, Minn., plans the construction of a repair shop for repair of electric locomotives here. Estimated cost $150,000. J. R. Davis, Ch. Engr.

Wis., Kewaunee—Leyse Aluminum Co., A. Leyse, Mgr., will build a 2 story, 76 x 97 ft. factory. Noted Aug. 25. Private plans.

Wis., La Crosse—H. Newberg, awarded contract for the construction of a 2 story, 60 x 145 ft. garage at Sixth Ave. and Main St. Estimated cost $55,000. Preeschl & Hanson, 1603 Johnson St., Archts.

Ont., Ottawa—Beach Motors Ltd., Bank St., will build a 2 story garage. Estimated cost $50,000. J. A. Euart, Jackson Bldg., Archt.